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IDENTIFICATION OF NURSERY STOCK

APPLE, APRICOT, CHERRY,
PEACH, PEAR, AND PLUM VARIETIES
AND ROOTSTOCKS

K. LAPINS

Experimental Station,
Summerland, British Columbia

CANADA DEPARTMENT OF AGRICULTURE

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INTRODUCTION

This bulletin reports on studies of the vegetative characteristics of fruit tree varieties and rootstocks in the nursery. The work was conducted as one of the research projects proposed and sponsored by the British Columbia Fruit Growers Association and was intended to be the first phase of nursery inspection. Fruit growers in the Southern Interior of British Columbia realized the economic loss caused by planting misnamed trees in their commercial orchards and believed that the loss could be eliminated by using nursery stock that had been inspected and certified to be true to name of variety and rootstock.

Nursery inspection for trueness of variety and rootstock is in progress in several countries of Europe, (England, Germany, The Netherlands, Sweden, Switzerland), in the Province of Ontario, Canada, and in several states of the U.S.A. (13, 14, 33, 48). In Ontario and in some states of the U.S.A., nursery inspection has been practised for over 25 and over 30 years, respectively, and has considerably reduced the number of misnamed trees in fruit growers' orchards.

The purpose of this publication is to provide simple and reliable methods of identification and to give brief descriptions of fruit tree varieties and rootstocks. There are many publications dealing with fruit tree variety and rootstock identification. The present publication, however, presents certain new information with particular emphasis on varieties and rootstocks which have commercial value in the fruit growing areas of British Columbia. Descriptions of common varieties in this report may differ slightly from those in other publications since the present descriptions are based upon one-year-old trees only. This report also contains identification methods and variety descriptions of apricot, not found in other publications; the use has been made of leaf measurements in identification of peach varieties; a brief discussion is given on an approach to methods of distinguishing the colored strains of apple from their original varieties; methods of identification of apricot, peach, and cherry varieties by their stones are described, so as to make possible certification of seed material for raising of rootstocks.

MATERIALS AND METHODS

Variety and rootstock studies were conducted at the Experimental Station, Summerland, B.C. and in 13 commercial fruit tree nurseries of British Columbia in 1951 and 1952. Some additional data on peach varieties were also collected in 1953. Most of the results discussed in this bulletin are based on two years' observations.

Commercial nurseries were located in climatically different regions of B.C. thus providing diverse plant material for variety studies. The Station orchards and nursery were used to check the identity of varieties in the commercial nurseries. At the Station, special studies were conducted of peach varieties, of strains of some apple and prune varieties, and of clonal rootstocks.

The list of varieties and rootstocks includes those that are found most commonly in the nurseries of B.C., and especially those that have economic value for the fruit industry of the Southern Interior of B.C., as well as some of less important varieties that may resemble and are liable to be mixed with the commercial varieties.

During the studies comprehensive variety and rootstock descriptions were made; information from the individual descriptions was condensed on one descriptive sheet for each variety. Thus the variety descriptions presented here are the result of a mathematical summation of information recorded in different nurseries and years.

In some instances, measurements and counts of the various characteristics were made but the results have been presented here mostly in descriptive terms. Color of mature bark was recorded using Ridgway's Color Standards and Nomenclature (32) but the color numbers, such as 3''κ, are given here only in some instances. In peach varieties, however, leaf measurements were used as almost the only valuable means of identification.

Each fruit (apple, apricot, etc.) has been discussed separately. Under each fruit, the valuable characteristics are listed first and one or two representative varieties are given as examples; then brief variety descriptions are presented. Prominent characteristics are printed in italics. The variety descriptions are often concluded with a brief account of how the variety differs from the other varieties with which it is most likely to be mixed. Identification keys have been prepared for all fruits with the exception of peach.

Methods commonly used in studying varieties. Observations of varieties in widely separated localities, with different climatic and growing conditions, reveal the variation range within a given variety and may give in a short time a good knowledge of the variety.

Selection of material for observation is the most important phase in variety studies. A general survey of all trees of a variety in the nursery block is necessary before the sample trees are selected for detailed studies.

Weak and sick trees should be excluded from variety studies. Very vigorous trees can be used, if allowance is made for deviation in some characteristics from normally growing trees. Very vigorous trees, compared with normal trees, are more branched and more buds are transformed into spurs; bark color tends towards more green and less red; leaves are darker, more glossy, more wrinkled, and less folded; serrations are coarser, deeper, more acute, more irregular, and leaf appears wild; growing tips show more green or yellow, less red color.

All characteristics, but especially leaves and buds, are slightly different if taken from different portions of a one-year-old shoot (46, 47). Therefore, only leaves or buds from the same zone of the shoot are strictly comparable.

The middle portion of a normally growing shoot should be selected for observation. The leaves should be fully developed but still young. Normally developed buds directly above the branching zone should be selected for bud studies. The branching zone is that portion of a shoot showing side branches or spurs and, in pear and plum, semi-developed spurs. Bark color, lenticels, and scarf skin, on the other hand, are best observed at the base of one-year-old shoots.

Selected trees should be closely studied—observing them until the general character of the variety and the main points of differences between similar varieties are firmly in one's mind. An essential phase of variety studies is comparison of similar varieties.

All plant characteristics are subject to fluctuation caused by environment but the range of fluctuation may be different with the various characteristics. Most valuable in variety identification are those characteristics that show great differences between varieties but only a slight fluctuation within varieties.

Characteristics that are very sensitive to environment, and therefore very variable, can be successfully used in variety studies only if the variability of these characteristics is realized. Even if a characteristic changes because of environment, the varieties maintain their relative order for this particular characteristic under different growing conditions. Direct comparison between varieties in respect to these variable characteristics should be made only in the same nursery. Size and color are among the most variable characteristics.

The most favorable period for observing the summer characteristics of all fruits, except peaches, is the early part of the growing season while the trees are in active growth and before the leaves are damaged by wind or disease. Cherries especially should be examined before the season's growth has ceased. Peach varieties, on the other hand, are best identified in late summer when the trees are almost fully developed.

Winter characteristics can be best studied before the trees are dug. In the digging process pubescence and scarf skin may be rubbed off, buds partly damaged (in apricot and peach), and observation of bark color made difficult, since the pigmentation on the sunny side of the tree is considered as standard.

APPLE VARIETIES

Identification of apple varieties of seedling origin is easy, with the exception of a few very similar varieties, such as Stayman, Turley, and Paragon. Methods of identification and descriptions of a great number of apple varieties are given by Shaw and French (37) and Shaw (35).

Valuable Characteristics

Of the various plant characteristics only those are mentioned here that have sufficient value for the identification of apple varieties. The type or range of variation of each characteristic is given and one or more varieties are presented as examples. The varieties that have been chosen are those that can usually be distinguished from each other by the characteristic in question. The same principle has been followed in other fruits.

LEAF BLADE

<i>Size</i>	large—McIntosh small—Jonathan
<i>Shape</i>	broadly oval—McIntosh, Stayman oval—Yellow Transparent ovate to oval—Delicious slightly obovate—Winesap (frequently)
<i>Apex</i>	broad and abrupt—Winesap narrow and tapering—Delicious
<i>Tip</i>	length: short—McIntosh medium—Spartan relatively long—Early McIntosh reflexion: heavy—Newtown slight—Lodi none—Yellow Transparent
<i>Reflexion</i>	heavy—Spartan moderate—Lodi slight to none—Yellow Transparent
<i>Folding</i>	heavily U-folded—Golden Delicious moderately V-folded—Newtown slightly to moderately saucer-folded—McIntosh, Hibernal
<i>Waving</i>	heavy—Golden Delicious (Fig. 1) light—McIntosh (Fig. 1) coarse—Yellow Transparent fine—Rome Beauty

Serrations.....sharpness: sharp—Delicious (Fig. 1), Spartan
 mostly dull—McIntosh, Winesap
 size: deep and wide—Spartan, Lodi
 shallow and narrow—McIntosh, Yellow
 Transparent
 uniformity: fairly regular—Stayman (Fig. 1),
 Spartan
 uneven and irregular—Winesap
 (Fig. 1), Newtown
 individual serration: single—Spartan
 double or triple—McIntosh, Early McIntosh



FIGURE 1.

Above: Waving of margin in apple leaves.

- | | |
|-------------------------------|------------------------------|
| 1. GOLDEN DELICIOUS—heavy; | 2. NEWTOWN—moderately heavy; |
| 3. SPARTAN—moderately slight; | 4. MCINTOSH—slight. |

Below: Types of serrations in apple leaves.

- | |
|---|
| 1. DELICIOUS—sharp, fine, single, fairly regular; |
| 2. STAYMAN—sharp, coarse, single and double; |
| 3. WINESAP—dull, very coarse, irregular. |

Pubescence.....very heavy—Jonathan
light—Transcendent

Texture.....wrinkled—Early McIntosh, Hiberna
pebbled—Winesap, Spartan
fairly smooth—Gravenstein, Yellow Transparent

PETIOLE

Length.....long—Delicious, Winesap
short—Hiberna

Stoutness.....slender—Jonathan
stout—Newtown, Spartan

Color.....dull red—Delicious
bright intensive red—Hiberna, Rome Beauty
green with pink—Newtown
green—Jonathan, Yellow Transparent

Leaf pose (Fig. 2)....fairly upright—Winesap
spreading—Yellow Transparent
drooping—Spartan
extremely drooping—King

GROWING TIP

Color.....silvery white—Jonathan, Yellow Transparent
yellowish green—Newtown, Golden Delicious
light green—McIntosh
green—Stayman
green with brown—Hiberna



FIGURE 2. Leaf pose of different apple varieties.

1. WINESAP—upright;
3. SPARTAN—drooping;

2. YELLOW TRANSPARENT—spreading;
4. KING—heavily drooping.

DORMANT SHOOT

<i>Length</i>	long—Delicious, Stayman moderately long—Winesap
<i>Length of internodes</i> ...	long—Yellow Transparent short—McIntosh, Winesap
<i>Stoutness</i>	stout—Canada Baldwin moderately stout—Winesap slender—Stayman, Delicious
<i>Direction</i>	straight—Canada Baldwin slightly straggling—Hibernal
<i>Degree of zigzag</i> (Fig. 3)	slight—Yellow Transparent none—Canada Baldwin
<i>Pubescence</i>	heavy—Newtown moderately heavy—Gravenstein and many others moderate—Golden Delicious moderately light—Transcendent
<i>Color</i>	blackish brown—Delicious vinaceous red with dark brown—Winesap, Spartan bright reddish brown—McIntosh, Rome Beauty light brown—Newtown, Yellow Transparent
<i>Side shoots on current year's growth</i>	many, long—Jonathan moderate in number, short—Winesap few—Delicious

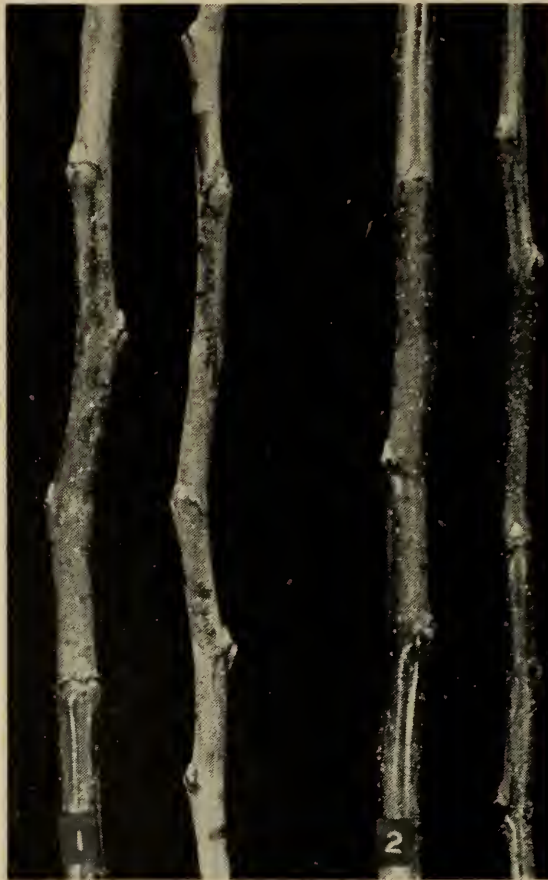


FIGURE 3. Extent of zigzag and prominence of bud supports in apple shoots.

1. YELLOW TRANSPARENT—slightly zigzag shoot; prominent bud supports;
2. CANADA BALDWIN—even shoot; slight bud supports.

LENTICELS

<i>Number</i>	abundant—Golden Delicious numerous—Delicious moderately numerous to few—Winesap, Spartan few—Gravenstein
<i>Conspicuousness</i>	conspicuous—Delicious inconspicuous—Yellow Transparent
<i>Size</i>	large—Transcendent, Golden Delicious small—Yellow Transparent some very small, in groups—Stayman, Winesap
<i>Raising</i>	raised—McIntosh flush—Yellow Transparent

BUDS

(Variation of buds on different parts of shoot shown in Fig. 4)

<i>Size</i>	large—Transcendent, Hiberna medium large—Delicious small—Northern Spy
<i>Shape</i>	narrow—Spartan medium broad—McIntosh very broad—Northern Spy
<i>Pubescence</i>	heavy—Spartan moderate—Golden Delicious



FIGURE 4. Variation of buds on different parts of shoot. Rome Beauty.

1. basal portion—very small, very broad buds;
2. middle portion—very large, long buds;
3. upper portion—small, underdeveloped buds.

Bud support.....large—Hibernal, Yellow Transparent (Fig. 3)
medium—Winesap
small—Canada Baldwin (Fig. 3), Rome Beauty

Ridges at the bud

support Hibernial

Rings at the bases of spurs and side shoots—Winesap

(Characteristics of dormant shoots of three similar apple varieties are shown in Fig. 5.)

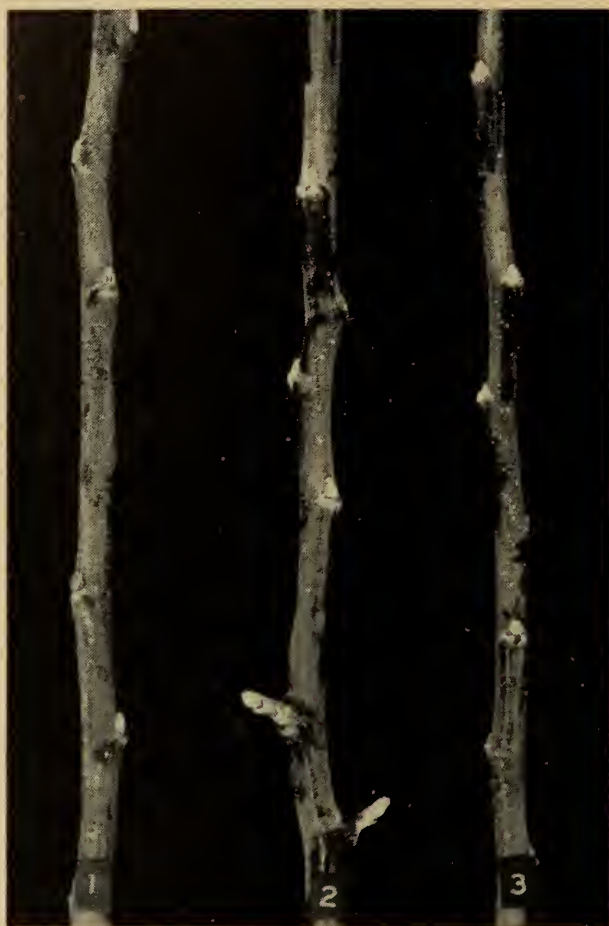


FIGURE 5. Characteristics of shoots of three similar apple varieties.

1. STAYMAN—very heavy pubescence; large, elongated buds;
2. WINESAP—stout shoot; prominent rings at bases of spurs;
3. DELICIOUS—slender shoot; prominent lenticels.

The Red Strains of Apple Varieties

The highly colored or red strains of apple varieties are considered as practically indistinguishable from the striped varieties by tree characteristics. Although certain strains of some apple varieties have shown striking differences in compatibility with the clonal rootstock USDA 227, there does not appear to exist any general correlation between the incompatibility with this rootstock and the color status of the strains (Shaw and Southwick, 38).

In the present studies, five apple varieties—Delicious, Jonathan, McIntosh, Spartan, and Winesap—both the striped types and the red strains, were budded on Malling XVI clones in a uniform nursery row. Very close observations of the trees in their first and second years' growth did not reveal any visual differences between the striped and the colored strains.

Since the fruit of striped and highly colored strains of apple varieties differs only in the amount of red color in the fruit skin (Strachan, 43), it is reasonable to expect that the difference, if any, between the trees could first be found in the amount of red pigmentation in bark and leaves.

An attempt was made to find a simple method of distinguishing the colored strains from the striped varieties by analyzing the amount of red pigment in trees of both groups.

The red, blue and violet pigments present in leaves, flowers and fruits of common fruit trees are mostly anthocyanins (7, 10, 22). The quality of red color in the fruit skin and in leaves and bark of the tree depends on the type of anthocyanin and on some other substances, such as anthoxanthins and tannins. In some preliminary tests anthoxanthins were separated from anthocyanins using the method of Lawrence and Scott-Moncrieff (21).

The amount of the total water-soluble pigments was determined in petioles of mature leaves and in the cortex of one-year-old shoots of the striped and colored strains of the five varieties mentioned above. The pigments were extracted from fresh material with normal hydrochloric acid solution and density of the red color of the filtrated extract was determined with the Klett Colorimeter.

In general, the colored strains of the varieties under test showed a slightly higher density of color extracts than their original varieties both in leaf petiole and in one-year-old bark tissue.

Since the differences between the varieties and their colored strains are only slight but the variation in the amount of red pigments due to environmental differences in the various locations can be expected to be relatively high, the analysis of pigments does not appear to provide simple and practicable means of distinguishing between the striped and colored strains of the apple varieties under the conditions of commercial nurseries.

Brief Descriptions

CANADA BALDWIN

(Fig. 6-1)

LEAF BLADE: large to very large, *broadly oval*, with *broad, sharply abrupt apex and very sharp, short and reflexed tip*; midrib heavily reflexed.

SERRATIONS: *sharp*, regular.

PETIOLE: stout, short, mostly red; leaf pose drooping.

STIPULES: *large*.

SHOOT: *stout, straight*, dark grayish brown.

LENTICELS: relatively conspicuous, raised.

BUDS: relatively small, *broad but acute*; *bud supports wide* but not raised.

DELICIOUS

(Fig. 6-2)

LEAF BLADE: ovate to oval, with *broadly acute apex* and medium to *long tip*; rather heavily U-folded, thick, pebbled, and wrinkled.

SERRATIONS: sharp, deep, *mostly single, fairly regular*.

PETIOLE: medium long, dull red; leaf pose spreading to upright.

SHOOT: *slender*, long, slightly zigzag, *blackish brown*, uniform in color.

LENTICELS: *numerous, conspicuous*, slightly raised.

BUDS: medium large, raised.

DIFFERS FROM:

Winesap by longer, narrower, more reflexed leaves with narrower apices and shorter tips; more folded and narrower tip leaves; sharper, finer, and more regular serrations; more slender shoots with thin tips; fewer side shoots and spurs; absence of prominent rings at the base of side shoots; darker bark color.



FIGURE 6. Typical leaves of four apple varieties.

1. CANADA BALDWIN;
3. EARLY MCINTOSH;

2. DELICIOUS;
4. GOLDEN DELICIOUS.

EARLY MCINTOSH

(Fig. 6-3)

LEAF BLADE: broadly oval, with broad, *abrupt apex and long, sharp tip*; *saucer-folded*, slightly reflexed, always *rugose*.

SERRATIONS: medium to dull, triple and double.

SHOOT: moderately stout, slightly zigzag, moderately pubescent, *grayish brown to brown*.

LENTICELS: moderately numerous, *relatively large*, slightly raised.

BUDS: medium to large, pubescent, raised.

DIFFERS FROM:

Yellow Transparent by thicker, more folded and rugose leaves; more reflexed midrib; coarser serrations; shorter petioles; more reddish bark; larger lenticels.

McIntosh by more folded, more wrinkled leaves, longer leaf tips; duller bark color; less conspicuous, slightly raised lenticels; slight branching.

GOLDEN DELICIOUS

(Fig. 6-4)

LEAF BLADE: long, oval, heavily reflexed in midrib, *very heavily U-folded, very heavily waved*, rigid, *slightly yellowish green*, glossy.

SERRATIONS: sharp, deep, coarse, double and single.

GROWING TIP: *yellowish*.

SHOOT: long, moderately pubescent, *brown* to greenish brown, *bright*, heavily branched.

LENTICELS: *very numerous, very conspicuous*, relatively large, slightly raised.

BUDS: *large*, moderately pubescent; bud supports raised, with all three ridges prominent.

DIFFERS FROM:

Newtown in winter characteristics by less pubescence on shoots and buds; brighter bark with less green in color; heavier branching; more numerous and larger lenticels; larger buds.

GRAVENSTEIN

(Fig. 7-1)

LEAF BLADE: relatively large, oval, with *broad, abrupt apex* and sharp, reflexed tip; *very slightly waved*, thick, dark green, glossy; folding slight to none, mostly saucer-shaped; *surface relatively smooth*.

SERRATIONS: rather sharp, fine, mostly single.

PETIOLE: medium in size; leaf pose drooping to spreading.

SHOOT: stout, slightly straggling, *heavily pubescent*, dark grayish and greenish brown; *heavy branching*.

LENTICELS: *few, not conspicuous*.

BUDS: heavily pubescent.

HIBERNAL

(Fig. 7-2)

LEAF BLADE: very large, *broadly oval*, with broad, *sharply abrupt apex and short tip*; saucer-folded, *heavily wrinkled*, glossy.

SERRATIONS: *sharp*, rather regular, double and single.

PETIOLE: stout, *short*, bright red.

GROWING TIP: green with yellowish and brownish tinge.

SHOOT: long, slightly *straggling and zigzag*, dark vinaceous brown; rather long internodes.

LENTICELS: moderately numerous to few, not conspicuous.

BUDS: *large*, moderately pubescent; bud supports raised, with *all three ridges prominent*.



FIGURE 7. Typical leaves of four apple varieties.

1. GRAVENSTEIN;
3. HYSLOP;

2. HIBERNAL;
4. JONATHAN.

HYSLOP (Fig. 7-3)

LEAF BLADE: oval, with broad, abrupt apex and *long, very sharp tip*; relatively *light green, heavily pubescent*, semi-glossy.

SERRATIONS: *sharp*, deep, coarse, double and triple.

PETIOLE: relatively long and slender, slightly red.

GROWING TIP: *heavily pubescent*, green to yellowish.

SHOOT: very long, *heavily zigzag, light brown, heavily pubescent*; heavy branching;
 long internodes.
 LENTICELS: relatively *large, russet*.
 BUDS: very large, narrow, moderately pubescent; bud supports prominent.

JONATHAN

(Fig. 7-4)

LEAF BLADE: *small, oval to ovate, with relatively narrow base and long tip; heavily U-folded, very heavily waved, light green, heavily pubescent*.
 SERRATIONS: sharp, very deep and coarse, irregular.
 PETIOLE: medium long, relatively narrow-angled; leaf pose spreading.
 GROWING TIP: *very heavily pubescent, whitish green*.
 SHOOT: *heavily pubescent, greenish or grayish brown, very heavily branched*.
 BUDS: relatively large, narrow, *very heavily pubescent*.

KING

(Fig. 8-1)

LEAF BLADE: medium large, broadly oval, with long and sharp tip; *midrib very heavily reflexed*; color dark green; surface glossy.
 SERRATIONS: sharp, coarse, single and double.
 PETIOLE: stout, short, wide-angled; *leaf pose extremely drooping*.
 GROWING TIP: whitish green.
 SHOOT: moderately stout, *straggling, heavily pubescent, greenish brown*.
 LENTICELS: rather conspicuous, *large, raised*.
 BUDS: heavily pubescent, variable in size and shape.

LODI

(Fig. 8-2)

LEAF BLADE: broadly oval to ovate, slightly reflexed, moderately U-folded, *moderately waved, medium to dark green, wrinkled*.
 SERRATIONS: *sharp, coarse, mostly single*.
 GROWING TIP: heavily pubescent, fresh green.
 SHOOT: very long, zigzag, *reddish brown*.
 LENTICELS: moderately numerous, slightly raised.
 BUDS: broad, moderately pubescent, appressed to shoot; bud supports prominent.
 DIFFERS FROM:

Yellow Transparent by more reflexed, more waved, thicker, darker colored leaves; sharper, coarser, mostly single serrations; reddish petioles; less pubescent, fresh green growing tips; more reddish color in bark; less pubescent shoot; raised lenticels.

McINTOSH

(Fig. 8-3)

LEAF BLADE: broadly oval, *saucer-folded, very slightly waved, light green, heavily pubescent, dull to semi-glossy*.
 SERRATIONS: relatively *dull, mostly double*.
 PETIOLE: medium long, *wide-angled*; leaf pose drooping.
 GROWING TIP: heavily pubescent, *whitish green*.
 SHOOT: long, moderately stout, straight, *bright brown, moderately pubescent; short internodes; heavy branching*.

LENTICELS: *numerous, very conspicuous, definitely raised.*

BUDS: large, moderately pubescent; bud-shoot angle variable, many buds wide-angled; bud supports prominent.

DIFFERS FROM:

Spartan by lighter colored, less shiny leaves; duller, finer, mostly double serrations; whitish tip leaves; heavy branching; bright, reddish bark color; prominent lenticels.

Early McIntosh by less folded and less wrinkled leaves; shorter leaf tips; brighter bark color; more conspicuous and raised lenticels; heavy branching.



FIGURE 8. Typical leaves of four apple varieties.

1. KING;
3. MCINTOSH;

2. LODI;
4. NEWTOWN.

NEWTOWN

(Fig. 8-4)

LEAF BLADE: long, heavily reflexed, *heavily waved*, heavily wrinkled, green with *silvery cast*.

SERRATIONS: sharp, deep, *very coarse*, *very irregular*; many leaves lobed.

PETIOLE: rather short, narrow-angled; leaf pose drooping to spreading.

GROWING TIP: heavily pubescent, green to yellowish.

SHOOT: long, moderately stout, *very heavily pubescent*, grayish to greenish brown; heavy branching.

BUDS: small to medium, *mostly broad*, *heavily pubescent*, appressed to shoot; bud supports weak.

DIFFERS FROM:

Golden Delicious in winter characteristics by more green and gray color in bark; heavier pubescence; less conspicuous lenticels.

NORTHERN SPY

(Fig. 9-1)

LEAF BLADE: medium large, oval, sometimes with relatively *narrow base*, heavily reflexed in midrib and tip, somewhat rigid, glossy, dark green; *stipules large*.

SERRATIONS: sharp, shallow, mostly single, *irregular*; *some leaves lobed*.

PETIOLE: medium stout and long; leaf pose drooping.

SHOOT: slightly zigzag, heavily pubescent, brownish or greenish gray; *slender tips*.

LENTICELS: numerous, conspicuous.

BUDS: *small*, *very broad*, heavily pubescent, *closely appressed* to shoot; bud supports prominent.

ROME BEAUTY

(Fig. 9-2)

LEAF BLADE: small, narrow, heavily U-folded, heavily waved, thick and *rigid*, relatively *dark green*, *glossy*, moderately pubescent.

SERRATIONS: *very sharp*, deep, mostly double, irregular.

GROWING TIP: green, mixed with yellow and brown.

SHOOT: moderately stout, straight, *bright reddish*; *very heavily branched*.

BUDS: *variable*, mostly long, narrow, acute, moderately pubescent; tips of shoots mostly poorly developed, with small buds.

SPARTAN

(Fig. 9-3)

LEAF BLADE: heavily reflexed in midrib and tip, slightly waved, dark green, semi-glossy, heavily wrinkled and *pebbled*.

SERRATIONS: *sharp*, *very coarse*, *mostly single*.

PETIOLE: stout, wide-angled; leaf pose drooping.

GROWING TIP: heavily pubescent, slightly yellowish.

SHOOT: long, moderately stout, heavily pubescent, blackish or *vinaceous brown*; side shoots only few.

LENTICELS: moderately numerous or *few*, moderately conspicuous, mostly flush.

BUDS: relatively large, *narrow*, acute, heavily pubescent.

DIFFERS FROM:

McIntosh by darker, more shiny, more pebbled, more folded leaves; sharper, coarser, mostly single serrations.

Winesap in winter characteristics, by slenderer shoots; less branching; fewer lenticels; longer buds.

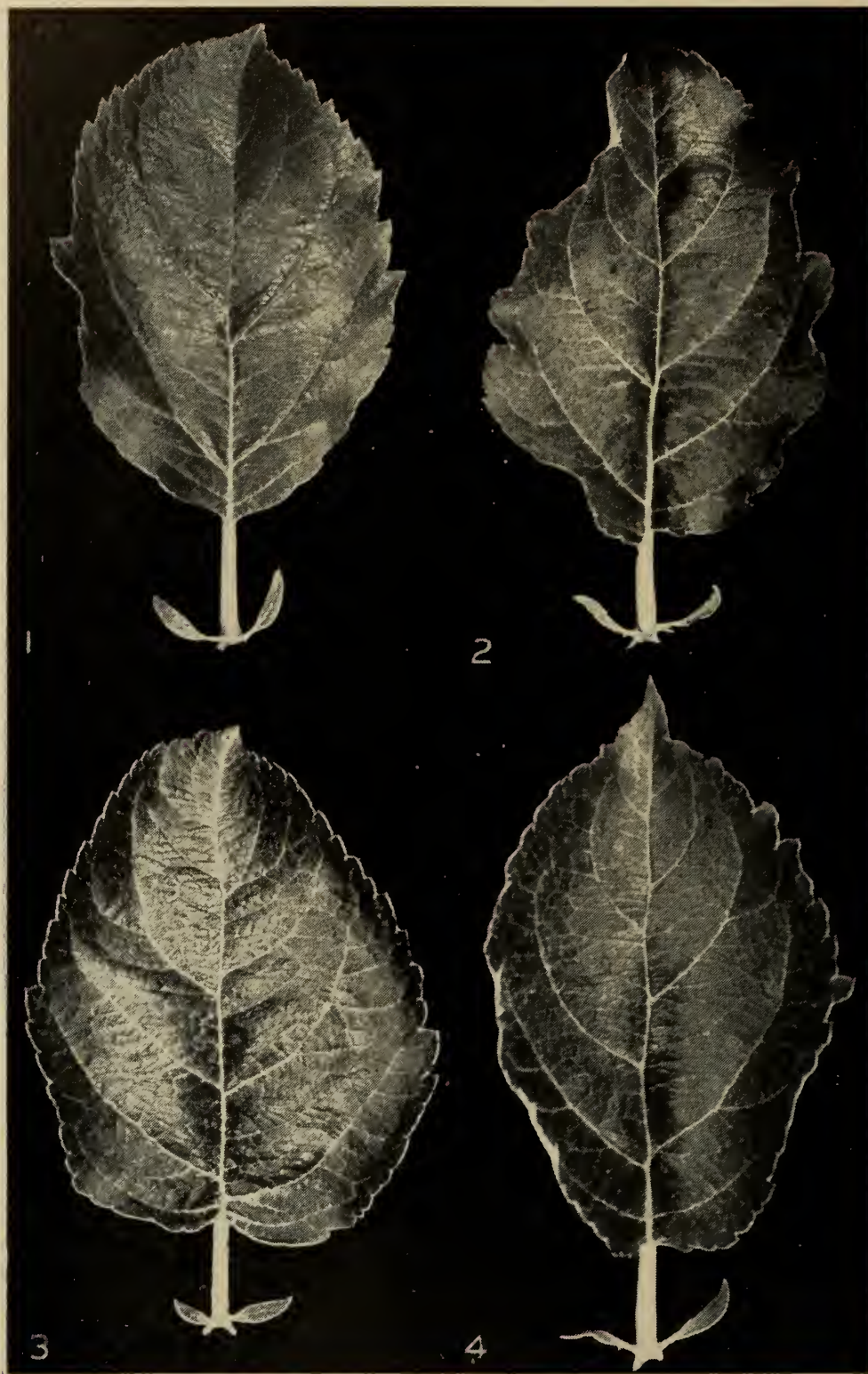


FIGURE 9. Typical leaves of four apple varieties.

1. NORTHERN SPY;
3. SPARTAN;

2. ROME BEAUTY;
4. STAYMAN.

STAYMAN

(Fig. 9-4)

LEAF BLADE: broadly oval with broad, *abrupt apex and long tip*; heavily *U-folded*, slightly waved, heavily pubescent.

SERRATIONS: *sharp, very deep and coarse*, relatively regular; *individual serrations slightly overlapping*.

PETIOLE: fairly long and slender, dull red at base; leaf pose spreading.

GROWING TIP: heavily pubescent, whitish green.

SHOOT: very *long, rather slender*, slightly straggling, very heavily pubescent, blackish brown; *scarf skin heavy*.

LENTICELS: moderately numerous to few, *variable in size*; groups of very small lenticels in the middle portion of one-year-old shoot.

BUDS: large, narrow, heavily pubescent, appressed to shoot.

DIFFERS FROM:

Winesap by larger, longer, more folded leaves, with shorter tips; sharper, more uniform serrations; longer, slenderer shoots; fewer spurs; more black and gray in bark color.

Delicious by more oval shape of leaf blade, uniform in folding; coarser serrations; more violet color in bark, heavier pubescence; small lenticels; more prominent rings at bases of spurs.

TRANSCENDENT

(Fig. 10-1)

LEAF BLADE: *very large, oval*, with broad, abrupt apex and long tip, slightly reflexed or straight in midrib, slightly saucer-folded, thick, *dark green, glossy*, slightly pubescent, smooth.

SERRATIONS: sharp, mostly double, regular.

PETIOLE: long, slender, yellow, red at base.

GROWING TIP: slightly pubescent, yellowish green.

SHOOT: long, slightly straggling and zigzag, *moderately pubescent*, light reddish; heavy scarf skin; long internodes.

LENTICELS: *large, conspicuous*.

BUDS: large, narrow, *moderately pubescent*; bud supports raised, all three ridges prominent.

WEALTHY

(Fig. 10-2)

LEAF BLADE: medium in size, oval to ovate, with reflexed and *twisted tip*; heavily *U-folded, heavily waved*, thick, semi-glossy.

PETIOLE: long, slender, red at base; *petiole-shoot angle narrow*; leaf pose spreading.

SHOOT: moderately long, slender, slightly zigzag, moderately pubescent, dark brown; *a few side branches* from one-year-old shoot; long internodes.

LENTICELS: *numerous, conspicuous*, relatively large, grayish white, flush or slightly raised.

BUDS: relatively large, acute, *moderately pubescent*, appressed to shoot.



FIGURE 10. Typical leaves of four apple varieties.

1. TRANSCENDENT;
3. WINESAP;

2. WEALTHY;
4. YELLOW TRANSPARENT.

WINESAP

(Fig. 10-3)

LEAF BLADE: *small*, broadly oval, with *broad, abrupt apex* and long tip; dark green, heavily pubescent, heavily pebbled.

SERRATIONS: deep, *very coarse, irregular; many leaves lobed*, some leaves with entire margins.

PETIOLE: rather long and slender, relatively narrow-angled; leaf pose spreading to upright.

SHOOT: rather *stout*, heavily pubescent, dark vinaceous brown; *short internodes; many spurs and side branches* from one-year-old shoot; *prominent rings* at bases of spurs and side branches.

LENTICELS: moderately numerous, variable in size; small lenticels in groups in middle portion of shoot.

BUDS: relatively small, heavily pubescent, upper buds poorly developed.

DIFFERS FROM:

Delicious by broader leaves with more abrupt apexes and longer leaf tips; more irregular, coarser serrations; stouter shoots, more spurs and side branches; prominent rings at bases of spurs; lighter, more violet bark color.

Stayman by shorter, less folded leaves with longer tips; irregular, duller serrations; longer petioles; stouter growth; more violet in bark color; more spurs on one-year-old shoot; smaller buds.

YELLOW TRANSPARENT

(Fig. 10-4)

LEAF BLADE: broad-oval with long tip; *midrib nearly straight*; leaf moderately saucer-folded, *coarsely waved, light green*, dull, heavily pubescent, *rather smooth*.

SERRATIONS: *mostly dull*, double and triple.

PETIOLE: medium long; leaf pose spreading.

GROWING TIP: very heavily pubescent, *whitish green*.

SHOOT: very long, rather slender, zigzag, *light brown*, moderately pubescent; long internodes.

LENTICELS: flush, *not conspicuous*.

BUDS: relatively large, pubescent, appressed to shoot; *bud supports prominent* with well-developed three ridges.

DIFFERS FROM:

Lodi by heavier pubescence and lighter color of leaves and growing tips; less waving in margin; less reflexed midrib; duller serrations; more green and yellow, less red color in bark.

Early McIntosh by less reflexed, less wrinkled, more waved, lighter colored leaves; less red in bark color; less prominent lenticels.

Key to Apple Varieties

SUMMER CHARACTERISTICS

- A Leaf blade ovate to oval; apex tapering or slightly abrupt
- B Serrations single, uniform; leaf medium or small, narrow-ovate..... Delicious
- BB Serrations mostly single; leaf large, broadly ovate or oval..... Lodi
- BBB Serrations mostly double or triple
- C Leaf base frequently broadly acute
- D Leaf small to very small, very heavily pubescent, occasionally lobed..... Jonathan
- DD Leaf medium in size, moderately to heavily pubescent, not lobed, leaf tip twisted and reflexed..... Wealthy
- CC Leaf base rounded
- D Leaf small, moderately pubescent; serrations very sharp, fine Rome Beauty
- DD Leaf large, heavily pubescent; serrations coarse, irregular... Newtown
- AA Leaf blade oval; apex abrupt to sharply abrupt
- B Leaf base frequently broadly acute; serrations sharp, irregular..... Northern Spy
- BB Leaf base rounded or cordate
- C Leaf midrib straight or slightly reflexed; serrations mostly dull... Yellow Transparent
- CC Leaf midrib excessively reflexed; serrations sharp, coarse..... King
- CCC Leaf midrib moderately to heavily reflexed
- D Leaf margin very slightly waved
- E Serrations sharp to medium sharp
- F Serrations sharp, slightly overlapping; leaf heavily folded..... Stayman
- FF Serrations medium sharp, irregular; some margins entire..... Winesap
- FFF Serrations medium sharp, fine; mature leaves not folded..... Gravenstein
- EE Serrations dull or predominantly dull
- F Leaf slightly folded; tip short..... McIntosh
- FF Leaf heavily to moderately folded, heavily wrinkled; tip long..... Early McIntosh
- DD Leaf margin slightly to moderately waved
- E Leaf upper surface smooth, glossy; lower surface slightly pubescent..... Transcendent
- EE Leaf upper surface wrinkled and pebbled, lower surface moderately to heavily pubescent
- F Serrations coarse, single; leaf surface pebbled, glossy. Spartan
- FF Serrations medium to fine; leaf surface wrinkled.....
- G Stipules large; leaf tip very sharp, reflexed..... Canada Baldwin
- GG Stipules medium in size; leaf very heavily wrinkled..... Hibernial
- DDD Leaf margin moderately to heavily waved
- E Lower surface of leaf heavily pubescent; growing tip whitish..... Hyslop
- EE Lower surface of leaf moderately pubescent; growing tip yellowish..... Golden Delicious

WINTER CHARACTERISTICS

- A Lenticels few; many side shoots from current year's growth; shoot heavily pubescent..... Gravenstein
- AA Lenticels moderately numerous
 - B Buds small, broad; bud supports prominent; shoot tips thin..... Northern Spy
 - BB Buds medium to small
 - C Shoots stout, relatively short
 - D Side shoots few or absent, bark dark grayish brown..... Canada
Baldwin
 - DD Side shoots few to medium, spurs many; bark dark vinaceous brown; rings at bases of spurs..... Winesap
 - DDD Side shoots many; bark bright reddish; buds variable in shape Rome
Beauty
 - CC Shoots moderately slender to slender
 - D Bark very dark, blackish brown
 - E Shoots slender, slightly straggling; small lenticels in groups Stayman
 - EE Shoots moderately stout, straight; lenticels not in groups. Spartan
 - DD Bark greenish dark brown, shoot straggling, heavily pubescent King
 - DDD Bark yellowish to greenish light brown; lenticels inconspicuous Yellow
Transparent
 - DDDD Bark reddish or grayish brown; lenticels conspicuous
 - E Shoots moderately stout, grayish brown to brown..... Early
McIntosh
 - EE Shoots long, slender, reddish brown..... Lodi
 - BBB Buds large
 - C Buds heavily pubescent; many side shoots from current year's growth..... Jonathan
 - CC Buds moderately pubescent; one-year-old shoots slightly or not branched
 - D Shoots moderately long, straggling; lenticels inconspicuous.. Hibernial
 - DD Shoots very long, slender; lenticels large, conspicuous..... Transcendent
- AAA Lenticels numerous to very numerous
 - B Buds small, broad; shoots stout, heavily pubescent, greenish brown... Newtown
 - BB Buds medium to large
 - C Bark dark to blackish brown
 - D Bark dark brown, uniform; shoots relatively short, slender; lenticels large..... Wealthy
 - DD Bark blackish brown; shoots long, thin at tips; buds large... Delicious
 - CC Bark bright reddish brown; shoots moderately stout; some buds wide-angled..... McIntosh
 - CCC Bark light or greenish brown; shoots long, relatively slender
 - D Shoots heavily pubescent; lenticels russet, slightly raised... Hyslop
 - DD Shoots moderately pubescent; lenticels gray or white, raised... Golden
Delicious



FIGURE 11. Types of leaf shape in apricot.

1. TILTON—roundish;
2. WENATCHEE—ovate to roundish ovate;
3. RELIABLE—ovate;
4. BLENHEIM—roundish ovate.

APRICOT VARIETIES

No publications are known concerning the identification of apricot varieties from non-bearing trees.

Valuable Characteristics

LEAF BLADE

Size.....very large—Wenatchee
small—Blenheim

Shape (Fig. 11)..... roundish—Tilton
roundish ovate—Blenheim
ovate to roundish ovate—Wenatchee
ovate—Reliable

<i>Apex</i>	wide and abrupt—Tilton relatively narrow and slightly abrupt— Reliable
<i>Tip</i> (Fig. 12).....	short—Riland very long—Tilton twisted—Reliable
<i>Folding</i>	very heavy—Wenatchee moderate—Tilton slight—Perfection
<i>Waving</i>	coarse and deep—Wenatchee moderately coarse—Perfection fine and deep—Blenheim
<i>Color</i>	dark green—Perfection light green—Reliable
<i>Serrations</i> (Fig. 12)....	shallow and fine—Riland very deep and coarse—Blenheim
<i>Pubescence</i> (on lower surface).....	slight—Blenheim, Perfection very slight to none—Tilton, Reliable
<i>Principal veins</i>	dull red—Perfection bright red—Riland slightly pinkish—Blenheim

PETIOLE

<i>Size</i>	long and slender—Kaleden medium in length and thickness — Tilton (Fig. 13) relatively short and stout—Blenheim (Fig. 13)
<i>Color</i>	dull red—Perfection bright red—Reliable pinkish — Blenheim

GLANDS (Fig. 13)

<i>Number</i>	many—Tilton medium—Blenheim
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GROWING TIP

<i>Margin of tip leaves</i> (Fig. 13).....	upturned—Perfection back rolled—Reliable
<i>Color of tip leaves</i>	brownish red—Kaleden pink—Reliable yellow—Blenheim
<i>Pubescence of tip</i> <i>leaves</i> (lower surface) .	moderate—Blenheim slight—Tilton

TREE

- Habit*.....upcurving—Reliable (Fig. 14)
 upright spreading—Wenatchee (Fig. 14)
 spreading to drooping—Blenheim
 spreading and straggling—Perfection (Fig. 14)
- Size and number of side branches*.....many, well developed—Reliable
 some partially developed—Wenatchee
 sparse branching—Kaleden

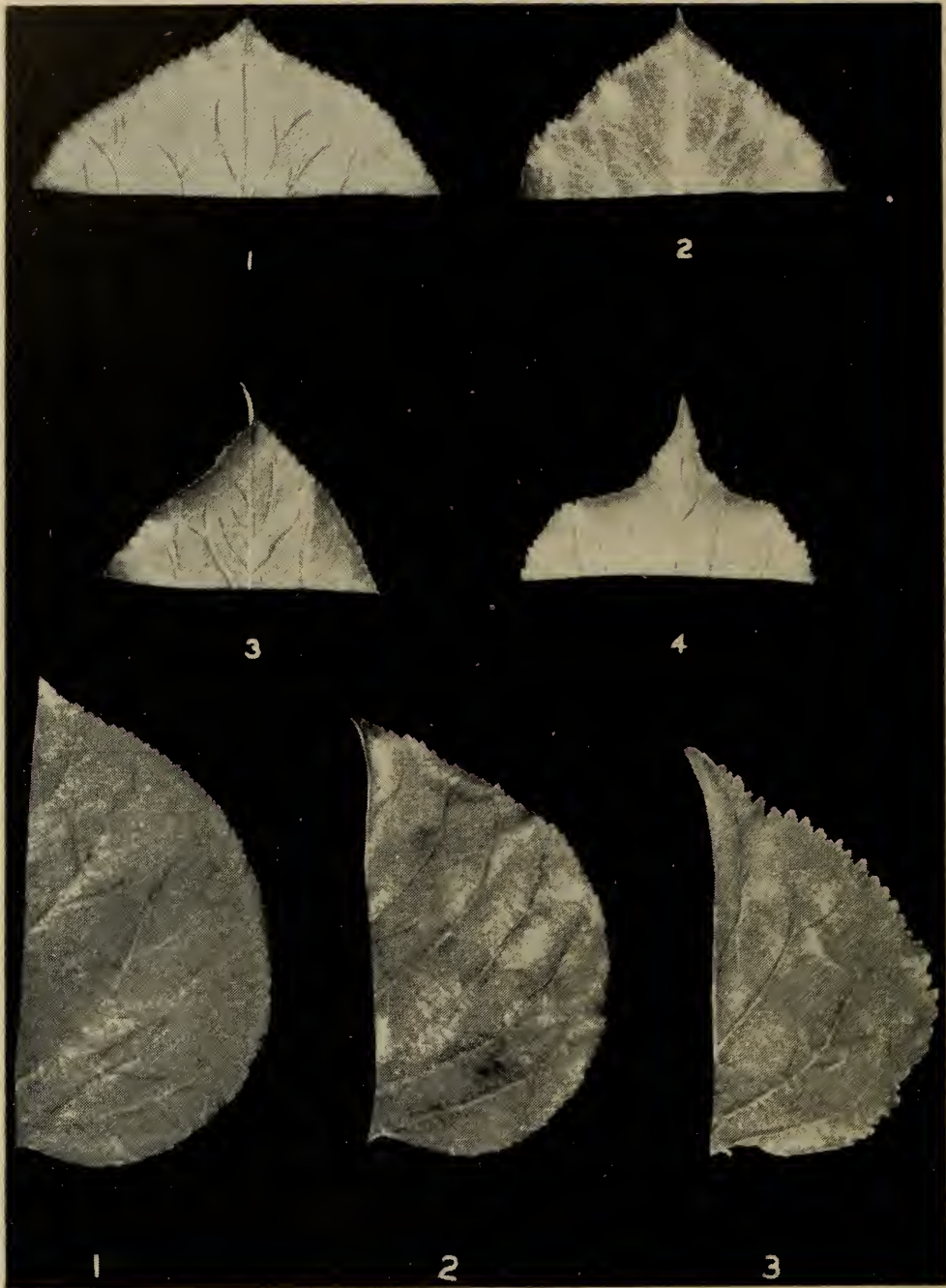


FIGURE 12.

Above: Characteristic leaf tips in apricot.

1. RILAND—short, broad; 2. WENATCHEE—medium short;
 3. RELIABLE—moderately long, 4. TILTON—very long.
 twisted;

Below: Types of serrations in apricot leaves.

1. RILAND—rounded, very fine; 2. WENATCHEE—moderately sharp;
 3. BLLENHEIM—moderately sharp,
 very deep.

DORMANT SHOOT

Length.....long—Perfection
moderately long—Wenatchee

Length of internodes....medium long—Perfection
very short—Tilton

Color of bark (dominating colors in the middle portion of side branches).....red and green—Blenheim
brown and green—Wenatchee
red and brown—Riland
red and gray—Reliable

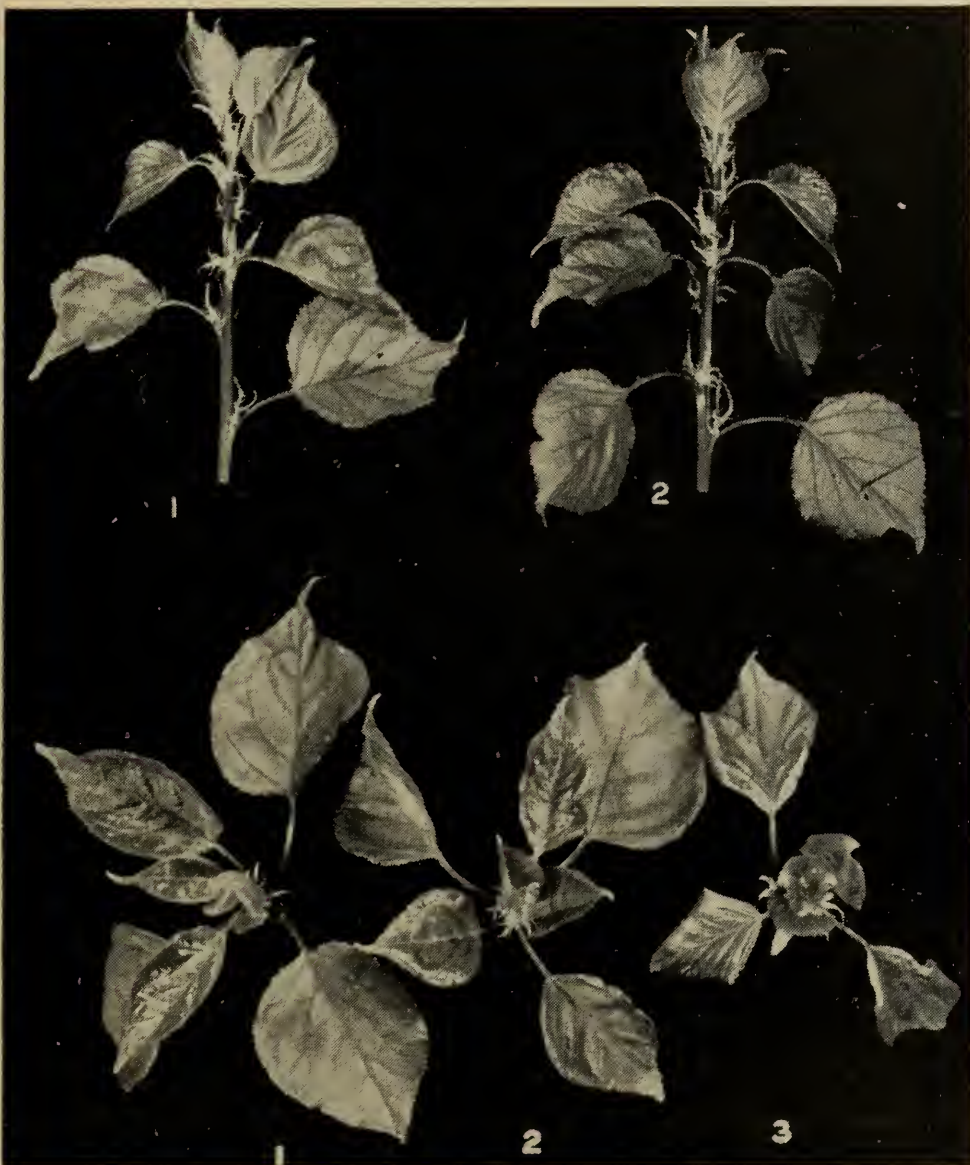


FIGURE 13.

Above: Number of glands and length of petiole in apricot leaves.

1. **BLENHEIM**—few glands, short 2. **TILTON**—many glands, long petiole.
petiole;

Below: Margin of tip leaves in apricot varieties.

1. **PERFECTION**—upturned; 2. **WENATCHEE**—slightly down-folded;
3. **RELIABLE**—heavily down-folded.

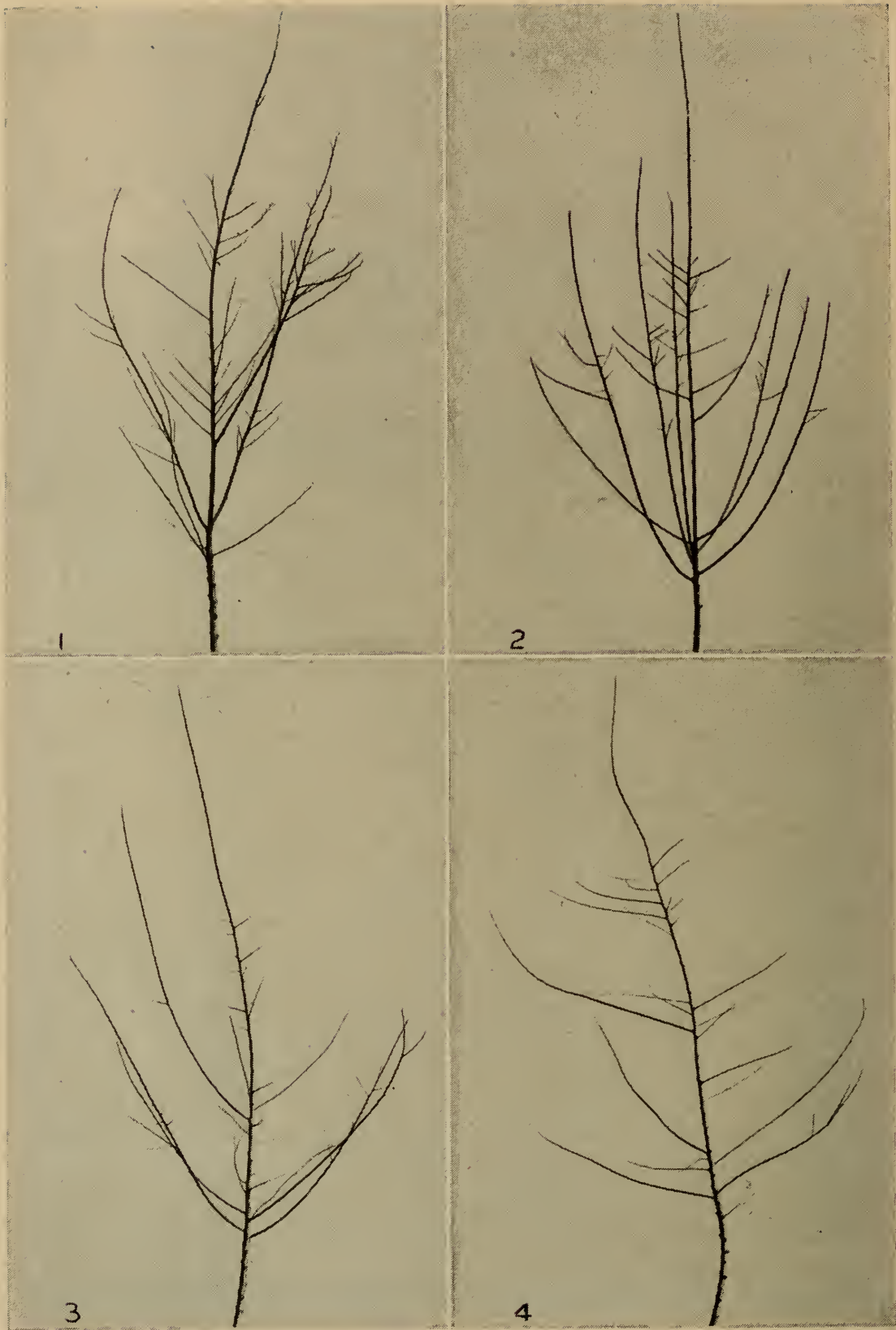


FIGURE 14. Types of tree habit in apricot.

1. WENATCHEE—upright-spreading, only a few side branches fully developed;
2. RELIABLE—upcurving, many strong side branches;
3. RILAND—spreading to upcurving; spurs with many large buds;
4. PERFECTION—widely spreading, straggling; vigorous tree.

LENTICELS (Fig. 15 and 16)

Size and shape.....large, roundish oval—Tilton
 medium in size, mostly elongated—Blenheim

BUDS

Size.....large—Perfection
 medium—Wenatchee
 small—Reliable (Fig. 16)

Shape.....broad, rounded, obtuse—Wenatchee
 narrow, long, acute—Perfection (Fig. 16)

Buds on thin side shoots..large, mostly in groups of 3 to 5—Riland
 small, in compact groups of 3—Reliable
 mostly single, relatively large—Perfection

Bud support.....very prominent—Tilton
 prominent—Wenatchee



FIGURE 15. Typical lenticels at the base of one-year-old trunk of apricot.

1. TILTON—conspicuous, large, oval to elongate;
2. BLENHEIM—moderately conspicuous, small, elongate.

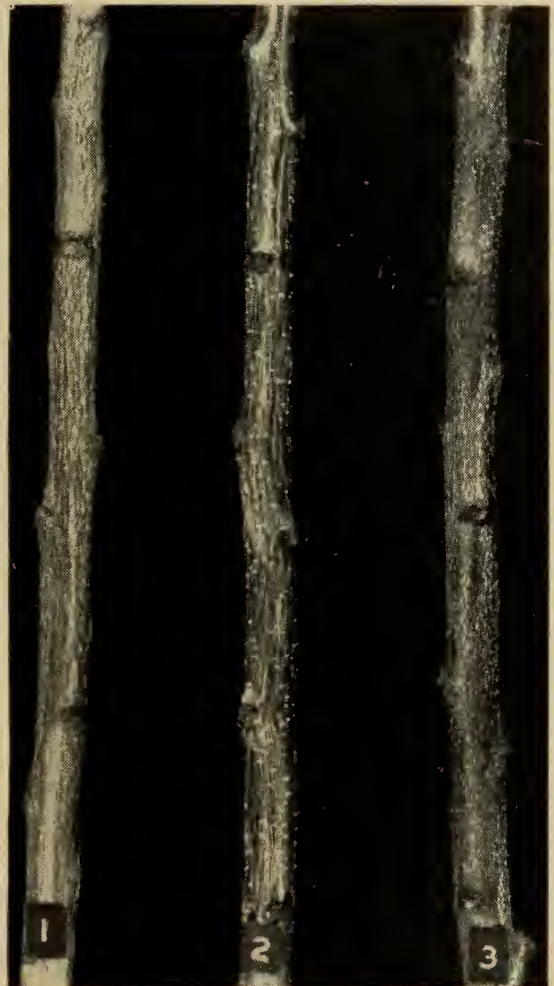


FIGURE 16. Buds and lenticels in the middle portion of one-year-old shoot of apricot.

1. RELIABLE—buds small, wide, blunt; lenticels many, not conspicuous;
2. TILTON—buds medium in size, protruding tissue above buds; lenticels conspicuous;
3. PERFECTION—buds long, acute; lenticels many, conspicuous.



FIGURE 17. Typical leaves of four apricot varieties.

1. BLENHEIM;
3. PERFECTION;

2. KALEDEN;
4. RELIABLE.

Brief Descriptions

BLENHEIM

(Fig. 17-1)

LEAF BLADE: relatively *small, roundish ovate* with broad, abrupt apex and long tip; leaf heavily saucer-folded, margin heavily waved with fine waves; pubescence slight to moderate.

SERRATIONS: fairly sharp, *very deep*, single and double.

PETIOLE: *short*, wide-angled.

GLANDS: mostly on petiole, 3 to 4.

GROWING TIP: yellowish, brownish, and pinkish; tip leaves rather heavily *pubescent on lower surface*.

SHOOT: heavily branched; relatively rich in green and yellow colors in bark; *short internodes*.

BUDS: *small, broad, wide- to narrow-angled; bud supports prominent; swollen tissues also above the buds.*

DIFFERS FROM:

Tilton by smaller, more ovate, more folded and waved, lighter colored leaves; more heavily pubescent tip leaves; shorter petioles; fewer glands; less prominent, usually elongated lenticels.

KALEDEN
(Fig. 17-2)

LEAF BLADE: heavily *saucer-folded with reflexed tip*; dark green, relatively dull; bright red principal veins.

PETIOLE: *very long, slender, deep red*, partly pubescent.

GLANDS: dull red, more than 4.

GROWING TIP: *reddish to brownish*.

TREE: vigorous, upright with a few side branches.

SHOOT: *long, slender, zigzag*, bright brown, uniform in color; *internodes long*.

LENTICELS: numerous, conspicuous, raised.

BUDS: *large*.

PERFECTION
(Fig. 17-3)

LEAF BLADE: *ovate to cordate*, with *long, twisted, reflexed tip*; leaf slightly folded, dark green, somewhat dull, *slightly pubescent*; principal veins red.

SERRATIONS: rather sharp, deep, usually single.

GLANDS: on petiole and blade, 2 to 3 on petiole; *small leaflets* at the base of leaf blade.

GROWING TIP: reddish; tip leaves wrinkled, *margins upturned*.

TREE: *very vigorous, widely spreading*.

SHOOT: very long, *straggling*, dark red on tip, dark brown in middle portion of shoot.

LENTICELS: numerous, conspicuous, raised.

BUDS: *large, acute, mostly single*; bud-shoot angle medium to wide.

RELIABLE
(Fig. 17-4)

LEAF BLADE: ovate, narrow with fairly long, *twisted and reflexed tip*; margin coarsely waved; color *light green*; surface smooth, semi-glossy; pubescence very slight; principal veins *bright red*.

PETIOLE: rather long and slender, glabrous or slightly pubescent, bright red.

GROWING TIP: bright, light red, *margins of unfolding tip leaves rolled back*, causing shiny appearance of the growing tip.

TREE: vigorous, *upcurving*, heavily branched.

SHOOT: long; color bright red at tip, *light gray in older bark*, especially in the shaded parts.

BUDS: *small, broad, rounded, mostly in compact groups of 3*; bud-shoot angle medium wide; bud supports prominent.

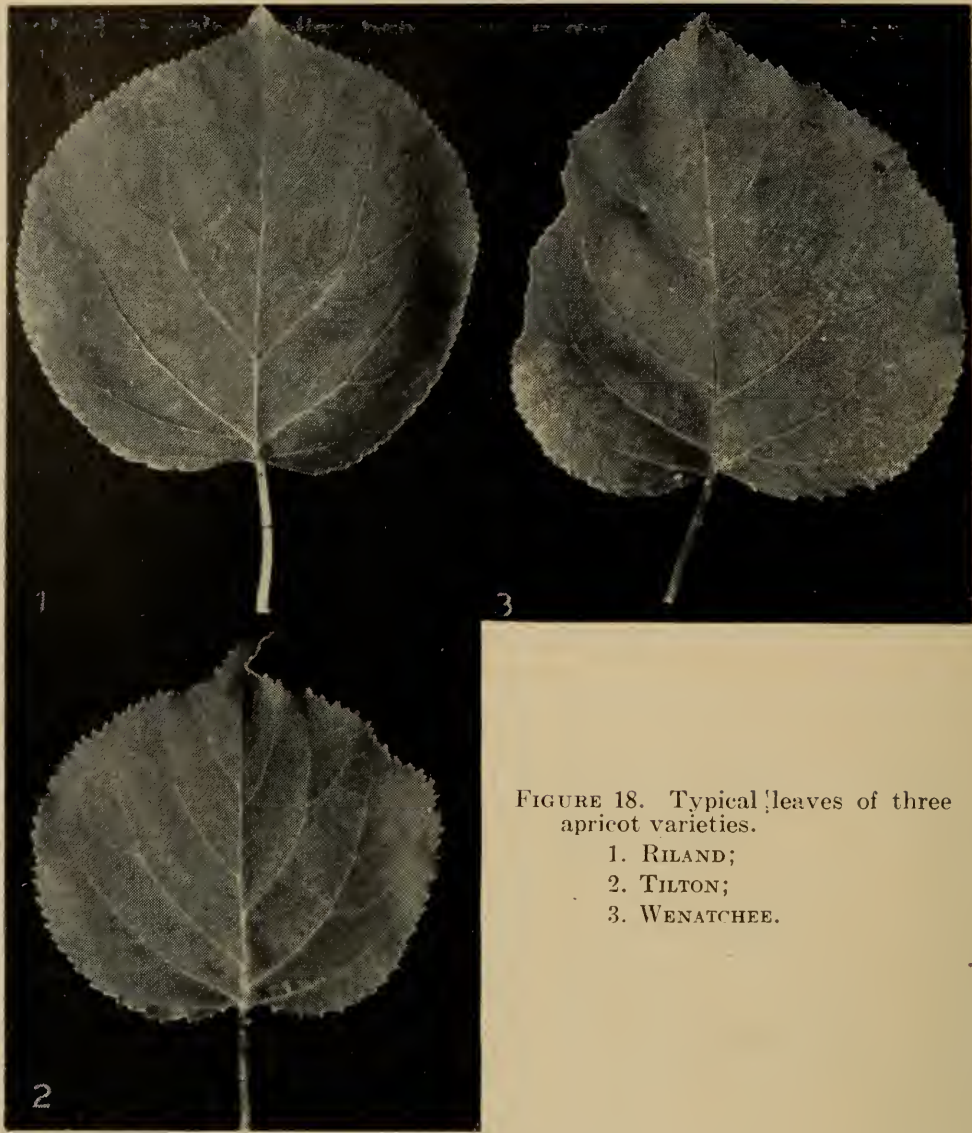


FIGURE 18. Typical leaves of three apricot varieties.

1. RILAND;
2. TILTON;
3. WENATCHEE.

RILAND (Fig. 18-1)

LEAF BLADE: large, *roundish*; with very broad, *sharply abrupt apex and very short, mostly reflexed tip*; slightly reflexed in midrib, rather heavily saucer- to U-folded; bright red principal veins.

SERRATIONS: relatively *dull, fine*, triple and double.

PETIOLE: *long*, slender, bright red.

GROWING TIP: reddish to brownish; tip leaves pubescent on lower surface.

SHOOT: *very long*, rather slender; color: dark and dull red on tips, predominantly brown in middle portion; *many small side shoots*.

BUDS: relatively large, frequently *in groups of 3 to 5*, especially on the small side branches.

DIFFERS FROM:

Wenatchee by more rounded leaves; shorter leaf tips; finer and duller serrations; more red color in petiole and veins; more brownish and more pubescent tip leaves; margins of tip leaves not back-folded.

TILTON
(Fig. 18-2)

LEAF BLADE: medium in size, roundish; apex very broad and sharply abrupt;
tip very long, twisted, reflexed; margin heavily waved; leaf thick, semi-glossy.

SERRATIONS: fairly sharp, *very deep*, single and double.

PETIOLE: *long*, wide-angled.

GLANDS: mostly on petiole, *more than 5 on mature leaves, up to 10 on young leaves*;
small leaflets at base of leaf blade.

GROWING TIP: reddish and yellowish.

SHOOT: many secondary shoots; short internodes; much green and yellow mixed
in older bark color.

LENTICELS: *very conspicuous, large, roundish oval*, raised.

BUDS: small, broad; *bud supports prominent*, tissue raised also above the buds.

DIFFERS FROM:

Blenheim by larger, more roundish, less folded, less waved leaves; longer petioles;
more glands; less pubescence on tip leaves; roundish oval, more conspicuous
lenticels.

WENATCHEE
(Fig. 18-3)

LEAF BLADE: *very large*, ovate to cordate, *very heavily folded*; waving coarse and
heavy; principal *veins slightly raised* above the upper surface.

SERRATIONS: moderately sharp, moderately deep, double and single.

PETIOLE: long, green or slightly reddish.

GLANDS: mostly on petiole, 3 to 4; frequently leaflets at the base of leaf blade.

GROWING TIP: reddish to yellowish; margins of tip leaves slightly rolled back.

TREE: vigorous, *spreading, many side branches underdeveloped*.

SHOOT: rather long, moderately stout; *brown and green* colors predominate in
the older bark.

BUDS: relatively *small, broad*, frequently in compact groups of 3.

DIFFERS FROM:

Riland by more cordate, more heavily folded leaves; heavier waving; longer leaf
tips; deeper and sharper serrations; less red in petiole and glands; back-
folded margins of tip leaves.

Key to Apricot Varieties

SUMMER CHARACTERISTICS

A Leaf roundish to roundish ovate, heavily to moderately folded

B Leaf tip short; serrations dull, fine.....Riland

BB Leaf tip medium in length; serrations moderately sharp, moderately
deep

C Leaf heavily U-folded, base frequently cordate.....Wenatchee

CC Leaf saucer-folded, base rounded.....Kaleden

BBB Leaf tip long; serrations moderately sharp, very deep

C Petiole long; glands over 5; tip leaves slightly pubescent.....Tilton

CC Petiole short; glands 3 to 4; tip leaves moderately pubescent....Blenheim

AA Leaf ovate, slightly folded

B Leaf dark green, dull; tip leaves cup-shaped, wrinkled.....Perfection

BB Leaf light green, glossy; tip leaves glossy, margins back-folded.....Reliable

WINTER CHARACTERISTICS

- A Buds large, elongate, acute
 - B Internodes long; shoots slightly zigzag; color bright brown, uniform.. Kaleden
 - BB Internodes medium long; shoots straggling; color dark brown, dull.... Perfection
- AA Buds small to medium, broad, blunt
 - B Lenticels oval, very prominent; bark color very bright..... Tilton
 - BB Lenticels elongate
 - C Older bark light gray; tree habit upcurving..... Reliable
 - CC Older bark brown; buds frequently in groups of 3 to 5..... Riland
 - CCC Older bark greenish or yellowish; buds frequently in groups of 3
 - D Lenticels moderately conspicuous; internodes short; bud supports very prominent..... Blenheim
 - DD Lenticels conspicuous, numerous; bud supports prominent.. Wenatchee

CHERRY VARIETIES

Identification of cherry varieties by summer characters is easy if inspection is done while the trees are in active growth. Some varieties may be very similar in the dormant stage and can present some difficulties in identification.

French (12) has made comprehensive studies of the vegetative characters of cherry varieties and has given detailed descriptions of many varieties and convenient comparisons of similar varieties. Useful information on the identification of cherry varieties is also given by Bunyard (4), Upshall (49) and Shoemaker (39).

Valuable Characteristics

LEAF BLADE

<i>Size</i>	very large—Deacon large—Star medium—Bing
<i>Shape</i>	broadly oval to ovate—Van broadly oval to obovate—Deacon
<i>Base</i>	rounded—Lambert cordate—Van
<i>Apex</i>	broad and abrupt—Lambert broadly acute, slightly abrupt—Star
<i>Tip</i>	short—Lambert medium long—Van long—Star
<i>Reflexion</i>	slight to none—Royal Ann moderate—Van
<i>Folding</i>	extent: heavy—Royal Ann moderate—Star slight—Lambert shape: U-folded—Black Republican saucer-folded—Lambert
<i>Waving</i>	extent: light—Bing moderate—Deacon moderately heavy—Black Republican coarseness: fine—Star medium—Royal Ann coarse—Black Republican
<i>Thickness</i>	thick, rigid—Bing thin, flexible—Deacon
<i>Color</i>	light, yellowish green—Black Republican light green—Lambert dark, dull green—Royal Ann
<i>Serrations</i>	sharpness: sharp—Deacon moderately sharp—Bing uniformity: fairly uniform—Royal Ann irregular—Black Republican
<i>Glossiness</i>	glossy—Bing semi-glossy—Star dull—Lambert

<i>Pubescence:</i> (on lower surface).....	very slight—Bing slight—Van slight to moderate—Deacon
<i>Texture</i>	wrinkled—Van veined—Star, Deacon fairly smooth—Lambert

PETIOLE

<i>Length</i>	long—Star medium—Deacon short—Van
<i>Stoutness</i>	slender—Deacon moderately stout—Star
<i>Pubescence</i>	none—Bing, Black Republican slight—Van moderate—Star, Lambert
<i>Leaf pose</i> (Fig. 19).....	spreading—Royal Ann spreading to drooping—Star drooping—Deacon

GLANDS

<i>Position on petiole</i>	close to blade—Lambert well below the blade—Bing
<i>Size</i>	small—Deacon medium—Star relatively large—Lambert
<i>Color</i>	yellowish red—Lambert orange red—Van bright red—Black Republican



FIGURE 19. Characteristic leaf pose of cherry varieties.

1. ROYAL ANN—spreading;
3. DEACON—drooping.

2. STAR—spreading to drooping;

GROWING TIP

Color of tip leaves yellowish—Lambert
 yellowish brown—Deacon
 pinkish—Van
 reddish—Bing
 reddish brown—Royal Ann

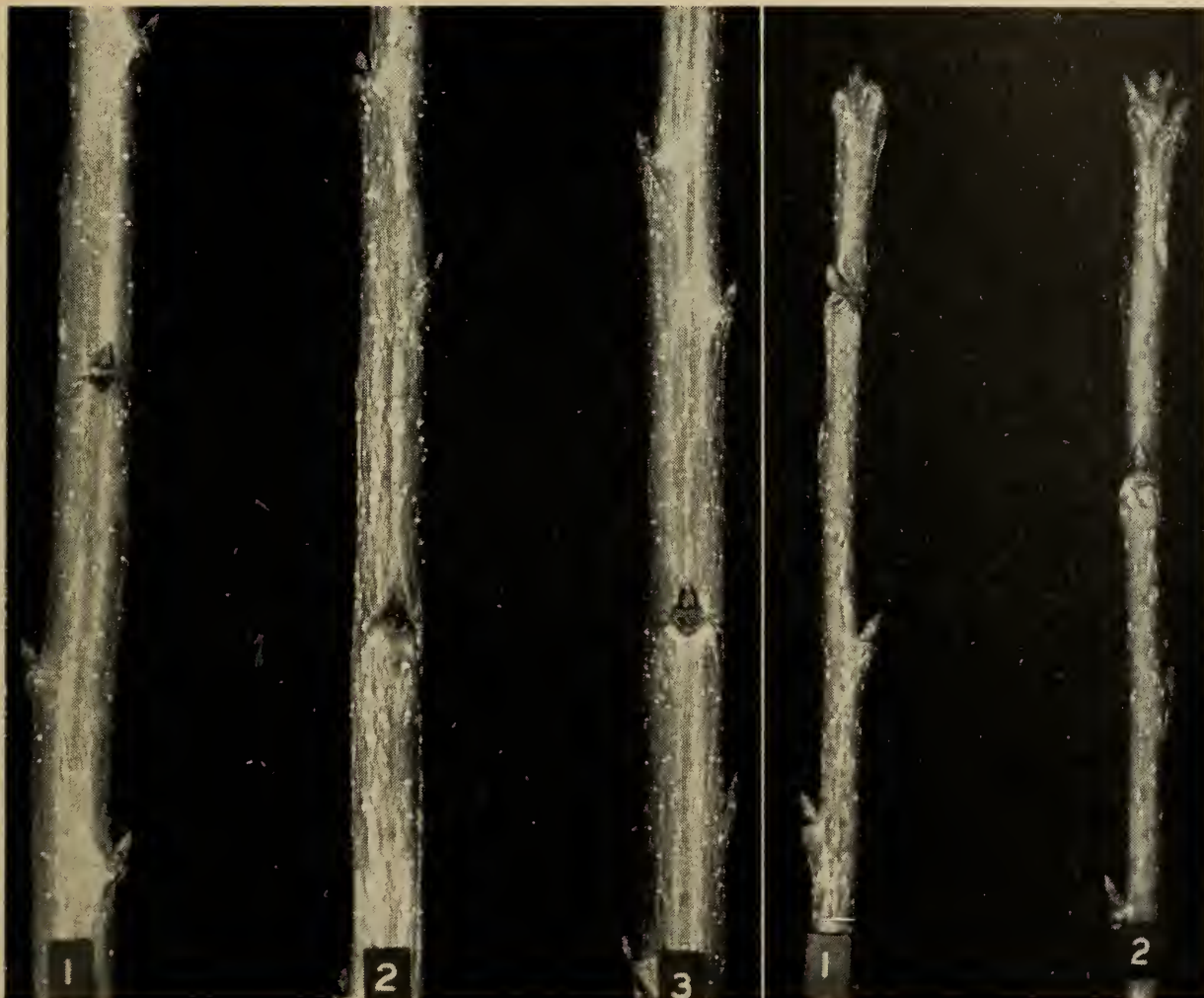


FIGURE 20.

Left: Buds, lenticels and formation of scarf skin in cherry.

1. BING—buds acute, wide-angled; lenticels few, inconspicuous, flush; scarf skin light;
2. DEACON—buds fairly blunt, narrow-angled; lenticels conspicuous, raised; scarf skin heavy;
3. LAMBERT—buds blunt; lenticels many, rather small, nearly flush; scarf skin moderate.

Right: Development of terminal buds in cherry.

1. DEACON—mostly single;
2. STAR—mostly in groups.

DORMANT SHOOT

Length very long—Van
 moderate—Bing

Length of internodes . . . short—Bing
 medium—Royal Ann
 medium long—Star

Stoutness slender—Bing
 moderately slender—Black Republican
 moderately stout—Star

<i>Scarf skin</i>	light—Bing (Fig. 20) moderate—Black Republican heavy—Deacon (Fig. 20)
<i>Number of side shoots</i> ...	many—Van medium to few—Black Republican few to none—Lambert

LENTICELS

<i>Number and conspicuous- ness</i>	medium in number, inconspicuous—Bing many, conspicuous—Deacon
<i>Size</i>	small—Bing medium—Black Republican large—Van
<i>Raising</i>	flush—Bing raised—Deacon

(Lenticels in Bing, Deacon, and Lambert shown in Fig. 20.)

BUDS (Fig. 20)

<i>Shape</i>	conic, acute—Bing ovate, slightly blunt—Deacon ovate, blunt—Lambert
<i>Bud-shoot angle</i>	narrow—Deacon narrow to medium—Lambert relatively wide—Bing
<i>Terminal buds</i>	single—Deacon in groups—Star

Brief Descriptions

BING

(Fig. 21-1)

LEAF BLADE: *medium in size*, wide, straight or slightly reflexed in midrib, *slightly waved*, slightly folded, thick, *dark green*, glossy.

SERRATIONS: relatively coarse, somewhat dull.

PETIOLE: medium stout, *glabrous*; leaf pose spreading.

GLANDS: on petiole, *well below the blade*.

GROWING TIP: *reddish to brownish*, *bright*.

SHOOT: rather *slender*, light reddish brown, *bright*; *light scarf skin*; short internodes.

LENTICELS: relatively small, not conspicuous, *flush*.

BUDS: acute, relatively *wide-angled*.

DIFFERS FROM:

Black Republican by smaller, less folded, less waved leaves; darker leaves and growing tips; slenderer growth, fewer side branches; smaller lenticels; lighter scarf skin; more acute buds, wider bud-shoot angle.

Royal Ann, in winter characteristics, by brighter bark color, lack of pubescence on shoots.

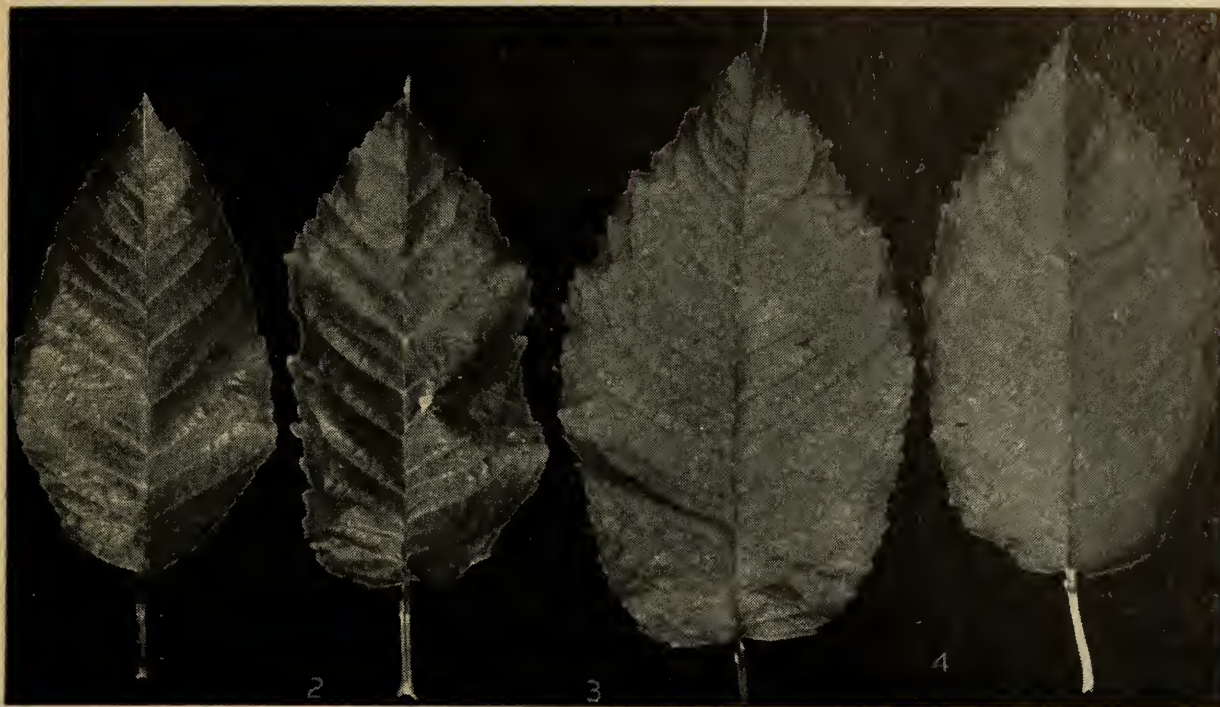


FIGURE 21. Typical leaves of four cherry varieties.

1. BING;
3. DEACON;

2. BLACK REPUBLICAN;
4. LAMBERT.

BLACK REPUBLICAN

(Fig. 21-2)

LEAF BLADE: rather heavily saucer- to V-folded, *heavily waved*, *light green*, glossy; base angle wide.

PETIOLE: *medium stout*, *glabrous*, green with bright red; leaf pose spreading to drooping.

GROWING TIP: *pinkish and reddish unfolding leaves* in contrast to yellowish green young and mature leaves.

SHOOT: moderately stout, glabrous, light reddish brown, *bright*; *scarf skin fairly heavy*.

LENTICELS: rather *large*, *russet*, slightly raised.

BUDS: acute and blunt, relatively *narrow-angled*.

DIFFERS FROM:

Bing by lighter color of mature and young leaves; heavier waving, folding and drooping of leaves; stouter growth; heavier scarf skin; larger, russet lenticels; larger, less acute buds; narrower bud-shoot angle.

DEACON

(Fig. 21-3)

LEAF BLADE: very large, oval to obovate; *base rounded to cordate*; apex broadly acute, tip fairly long; leaf somewhat *thin*, semi-glossy to dull, *moderately pubescent* on lower surface, *heavily wrinkled*.

PETIOLE: moderately long, slightly pubescent, dull red; *leaf pose drooping*.

GLANDS: on petiole, *relatively small*, 2 to 3, dull red.

GROWING TIP: yellowish brown; *young leaves drooping*.

SHOOT: long, moderately stout; *scarf skin heavy*; relatively long internodes.

LENTICELS: *numerous, very conspicuous, large, definitely raised*.

BUDS: medium to large, somewhat blunt, narrow-angled.

DIFFERS FROM:

Star by larger, more waved, less folded leaves; shorter, slenderer, darker, less pubescent petioles; smaller glands; drooping tip leaves; conspicuous, larger, more raised lenticels; duller bark with more green, less brown color; heavier branching.

LAMBERT

(Fig. 21-4)

LEAF BLADE: broadly oval to ovate with broad and abrupt apex; *straight in midrib, very slightly saucer-folded*, medium light green, dull.

PETIOLE: *long*, medium stout, pubescent; leaf pose spreading.

GLANDS: on petiole, some on blade, *large*, orange red.

GROWING TIP: *yellowish*; shoots very slightly pubescent.

SHOOT: moderately *stout*; older bark *grayish*; relatively *short internodes*; a few side shoots.

LENTICELS: moderately numerous, rather small, inconspicuous, flush or slightly raised.

BUDS: ovate, *blunt*; *weak bud supports*.

DIFFERS FROM:

Royal Ann, in winter characteristics, by gray bark, more green in tips; blunt buds.

Star, in winter characteristics, by brighter bark color, with less green; smaller lenticels; blunt buds.

ROYAL ANN

(Fig. 22-1)

LEAF BLADE: broadly oval to obovate, straight in midrib, rather *heavily U- to V-folded*, fairly thick, *dark green, dull*, moderately pubescent on lower surface.

PETIOLE: relatively stout, rather heavily pubescent, dull red; leaf pose spreading and drooping.

GROWING TIP: *brownish, dull*; shoot tips slightly pubescent.

SHOOT: somewhat stout, light brownish.

LENTICELS: relatively *small, not conspicuous*, slightly raised.

BUDS: rather *large, conic, acute*.

DIFFERS FROM:

Bing, in winter characteristics, by duller bark with more green color; very slight pubescence on shoots; slightly longer, more acute buds; terminal buds frequently in groups of 2 to 4.

Lambert, in winter characteristics, by brighter bark with more yellow color; lighter scarf skin; longer, acute buds.

Star, in winter characteristics, by lighter and brighter bark color; smaller lenticels; longer buds.



FIGURE 22. Typical leaves of three cherry varieties.

1. ROYAL ANN;

2. STAR;

3. VAN.

STAR

(Fig. 22-2)

LEAF BLADE: large, relatively narrow, ovate, with *narrow apex and long tip*; slightly reflexed in midrib, semi-glossy, wrinkled.

PETIOLE: *very long*, moderately stout, rather *heavily pubescent*, dull red.

GLANDS: mostly on petiole, 2 to 3, *large, bright red*.

GROWING TIP: *light yellowish brown*; shoot tips slightly pubescent.

SHOOT: long, relatively stout, rather intensive *brown*; *scarf skin heavy to moderate*; internodes relatively long.

LENTICELS: *conspicuous, large, raised*.

BUDS: relatively large, ovate, acute; *terminal buds in groups*.

DIFFERS FROM:

Deacon by smaller leaf with narrower apex and longer tip; heavier folding; longer, stouter, more pubescent petioles; larger, brighter glands; fewer, less raised lenticels; terminal buds in groups.

Royal Ann, in winter characteristics, by duller, grayish brown color; larger, raised lenticels; shorter buds.

Lambert, in winter characteristics, by grayish brown bark color; more, larger, raised lenticels; acute buds.

VAN
(Fig. 22-3)

LEAF BLADE: *large, oval to ovate; base rounded to cordate; apex rather narrow, tapering; surface semi-glossy to glossy, heavily wrinkled, slightly pubescent on lower surface.*

PETIOLE: *fairly stout and short, slightly pubescent.*

GLANDS: *mostly on petiole, 2 to 3, large, orange red.*

GROWING TIP: *pinkish unfolding leaves, especially their margins.*

SHOOT: *very long, heavily branched; internodes rather long; color yellowish brown in upper portion, light gray in older and shaded bark.*

LENTICELS: *moderately numerous, large, raised.*

BUDS: *medium to large, conic, acute.*

Key to Cherry Varieties

SUMMER CHARACTERISTICS

- A Petiole not pubescent
 - B Leaves slightly waved, dark green; growing tips reddish..... Bing
 - BB Leaves medium heavily waved, light green; growing tips pinkish.... Black
Republican
- AA Petiole slightly pubescent; leaves semi-glossy; growing tips pinkish.... Van
- AAA Petiole moderately or heavily pubescent
 - B Growing tip yellowish green; petiole very long; glands large..... Lambert
 - BB Growing tip yellowish brown
 - C Leaves slightly folded; tip leaves heavily drooping; petiole moderately long; glands small..... Deacon
 - CC Leaves moderately folded; tip leaves moderately drooping; petiole long; glands large, bright red..... Star
 - BBB Growing tip brownish; leaf heavily to moderately folded, dark, dull; petiole stout; glands orange red..... Royal Ann

WINTER CHARACTERISTICS

- A Lenticels moderately to heavily raised, conspicuous
 - B Shoot heavily branched; older bark light gray..... Van
 - BB Shoot moderately or not branched; older bark brownish gray
 - C Terminal buds single; lenticels very conspicuous..... Deacon
 - CC Terminal buds mostly in groups; lenticels conspicuous..... Star
- AA Lenticels slightly raised
 - B Buds predominantly blunt; shoot stout; internodes short..... Lambert
 - BB Buds acute or slightly blunt
 - C Lenticels small; scarf skin medium to light..... Royal Ann
 - CC Lenticels fairly large; scarf skin rather heavy..... Black
Republican
- AAA Lenticels flush, small; buds acute, wide-angled; shoot bright in color.... Bing

PEACH VARIETIES

Leaf Measurements

Peach varieties do not differ materially one from another in one-year-old trees and their identification presents great difficulties. Certain trends in peach breeding have made variety identification more difficult now than it was some decades ago. In some of the earlier publications concerning peach variety identification (15, 39, 48), such characteristics as the type of leaf glands or the color of the veins in leaves were found to be a valuable basis of classification. Now these characteristics are of very limited value since most modern peach varieties have reniform glands and yellow veins in their leaves. Furthermore, most varieties grown commercially in British Columbia are related to Elberta and are similar to the latter variety in the vegetative characteristics of trees.

Owing to the great similarity of varieties in the nursery, identification may be possible only if the growth of all varieties in the nursery block is normal and uniform. In plantings with poor or otherwise abnormal growth of trees, variety identification seems to be impossible. Further, the greatest care should be taken in selecting leaves which are characteristic of the variety. Indeed, "... the selection of criterion leaves upon which any classification of differences is based is the crux of the problem" (Sefick and Blake, 24). Leaves for comparison should be selected from trees of similar size and rate of growth and, moreover, should be taken from the same part or zone of the tree, preferably from the middle portion of the central shoot. Large leaves give more reliable results than smaller leaves (25, 26). Underdeveloped, disfigured or mechanically damaged leaves have no value in identification work.



FIGURE 23. Variation in petiole and glands in peach leaves.

1. VALIANT—petiole long; glands many;
2. SPOTLIGHT—petiole medium long; glands medium in number;
3. VETERAN—petiole short; glands medium to few; base angle wide.

In contrast to other fruits, peach varieties are best identified in the second part of the growing season, but before the leaves are disfigured by mildew, aphids, mites, etc.

Only a few plant characteristics have value in identification of peach varieties; among them, leaf blade, especially its dimensions and configuration, are most valuable. Measurements of leaf blade have been used rather successfully as one of the means of variety identification in mature peach trees and in blueberries (3, 5, 25, 26, 34). An attempt has been made here to apply the method in identification of nursery trees. A brief account is given of the methods used and the results obtained.

Leaf material was collected during the seasons of 1951, 1952, and 1953 in 6 different nurseries and the studies involved 10 varieties. For each sample 30 large, well-developed leaves were collected from 30 trees. Before measurements or counts were made the sample was reduced to 20 leaves. Glands were counted on the freshly gathered leaves, then the leaves were pressed, dried, and eventually measured.

A foliarmetric gauge, similar to that constructed by Meader and Blake (27), was made for the measurements of base angle at the distance of 1.5 cm. The maximum apex angle was measured by placing the leaf on a protractor; the sides of the angle passed through the points where the leaf outline at the apex changed from a straight or concave into a convex. Length and width of leaf blade and length of petiole were measured by placing the leaf on a sheet of paper squared in millimetres.

Ten different measurements or counts were made on the samples. The data obtained on 5 standard varieties—Elberta, Vedette, Veteran, Valiant and Spotlight—in 5 locations in 2 years were analyzed statistically in order to determine which of the measurements showed the greatest difference between the varieties in comparison with variation within variety. The F value obtained in the analyses of variance was mainly taken as a measure for the relative merit of a characteristic in variety identification.

The following 6 characteristics were found to be best adapted to differentiate between the 5 varieties:

- (1) width of leaf blade, expressed in percentage of length of leaf blade,
- (2) base angle, measured at 1.5 cm. from base,
- (3) apex angle, maximum,
- (4) length of petiole, expressed in percentage of length of leaf blade,
- (5) length of leaf blade,
- (6) total number of glands (on petiole and blade).

The average of each of these values for 10 varieties is given in Table 1. In the second part of the table, the average values are expressed in relative figures, taking Valiant as a standard (= 100).

Since not all varieties were available in each nursery each year, a complete statistical analysis of the data was not feasible. As far as the analyses were made the varieties in most cases showed significant differences at least in some of the characteristics.

The average measurements of Table 1 may serve as a basis when leaf measurements are used in variety identification. However, the differences between some varieties are relatively small and difficulties can be expected in identifying an unknown variety by a mere comparison of the absolute measurement figures of the unknown variety with those of Table 1.

Table 1.—Average Measurements of Peach Leaves

Data from 6 Nurseries in 1951, 1952, and 1953. Varieties in Order of Decreasing Relative Width of Leaf.

Variety	Length (L)	Width	Base angle	Apex angle	Length of petiole	Total glands	Number of samples
	cm.	in % of L	degrees	degrees	in % of L	no.	
Golden Jubilee.....	17.2	29.6	91.5	33.6	4.44	4.5	4
J. H. Hale.....	15.9	28.5	88.9	31.9	4.64	5.2	4
Vedette.....	16.7	28.4	89.3	31.6	4.62	5.0	17
Elberta.....	17.4	28.3	92.1	31.8	4.55	5.3	17
Veteran.....	17.9	26.8	90.3	29.6	4.18	5.1	17
Rochester.....	15.8	26.8	84.0	32.3	5.05	5.8	7
Solo.....	17.5	25.6	82.3	29.7	4.60	5.5	9
Redhaven.....	17.0	25.2	79.9	29.3	4.79	6.4	6
Spotlight.....	17.9	24.2	82.0	28.3	4.77	5.6	16
Valiant.....	17.5	23.8	75.9	29.2	5.58	8.1	18
Relative figures. Valiant = 100							
Golden Jubilee.....	98	124	120	115	79	55	
J. H. Hale.....	91	120	117	109	83	64	
Vedette.....	95	119	118	108	83	62	
Elberta.....	99	119	121	109	81	65	
Veteran.....	102	113	119	101	75	63	
Rochester.....	90	113	111	111	90	72	
Solo.....	100	107	108	102	82	68	
Redhaven.....	97	106	105	100	86	79	
Spotlight.....	102	102	108	97	85	69	
Valiant.....	100	100	100	100	100	100	

While the absolute values of the various measurements vary to a great extent due to location or year, the relations of any one characteristic between varieties vary considerably less; the varieties normally retain the same order for any character in all locations. Therefore the chances of correct identification can be increased if one known variety growing in the same nursery block as the unknown variety is also measured, and the measurements compared with those of the unknown variety. Relative figures (in relation to a variety selected as standard) are used in this comparison. Valiant has been chosen as standard in the present work since this variety is among the most popular varieties grown in British Columbia, and identification of Valiant is normally possible.

At least 20, or preferably 40 to 50, leaves of each variety should be measured. Data on all characteristics, as in Table 1, should be secured since one or a few characteristics alone may not make the identification possible.

Application of leaf measurements may aid materially in identification of peach varieties; yet it has definite limitations. Measurement figures may show significant differences between varieties if selected leaves from 20 or more trees are measured. This means that groups of trees rather than individual trees are identified. Individual plants can be identified or picked out of a mixed row only if easily distinguishable varieties are involved.

Valuable Characteristics

LEAF BLADE

Length.....long—Veteran, Spotlight
short—J. H. Hale

Width.....wide—Golden Jubilee, Elberta
medium—Veteran, Solo
narrow—Valiant, Spotlight

<i>Point of maximum width</i>	close to base—Golden Jubilee relatively high—Valiant, Redhaven
<i>Base angle</i>	wide—Elberta medium—Solo narrow—Valiant
<i>Apex angle</i>	wide—Golden Jubilee narrow—Veteran
<i>Reflexion</i>	heavy—Spotlight moderate to slight—Rochester, Vedette
<i>Wrinkling</i>	heavy—Elberta moderate—J. H. Hale

PETIOLE (Fig. 23)

<i>Length</i>	short—Veteran medium—Spotlight long—Valiant
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GLANDS

<i>Number</i>	small—Golden Jubilee, Vedette medium—Redhaven large—Valiant
---------------------	---

GROWING TIP

<i>Color</i>	yellowish—Elberta, Redhaven green—Spotlight, Rochester
--------------------	---



FIGURE 24. Number of fruit buds on one-year-old peach trees.

1. VALIANT—few; 2. VETERAN—many.

DORMANT TREES

<i>Vigor</i>	moderately vigorous—J. H. Hale vigorous—Elberta very vigorous—Rochester
<i>Size of side branches</i>	short—J. H. Hale medium long—Redhaven long—Spotlight
<i>Color of shoot tips</i>	pinkish—Elberta bright red—Redhaven dull red—Veteran dark red—Rochester
<i>Number of fruit buds</i> (Fig. 24).....	many—Veteran few—Valiant
<i>Terminal buds</i>	mostly single—Valiant, Spotlight mostly more than one—Elberta, Vedette

Brief Descriptions

ELBERTA
(Fig. 25-1)

LEAF BLADE: *broad* with the maximum width relatively low; *broad base* and acute apex angles; leaf heavily *reflexed in midrib*, *heavily wrinkled*, glossy, dark green.

PETIOLE: relatively short and stout

GROWING TIP: *yellowish*.

TREE: vigorous, shoots medium long, *stout*, *well matured*.

BARK COLOR: *pinkish red on tips* (3''k-5''k)*, *pinkish on shaded side* of the young shoots, yellowish and pinkish gray in older bark.

DIFFERS FROM:

Vedette by slightly longer leaves, heavier wrinkling and reflexion; less vigorous growth, stouter branches; lighter bark color.

Veteran by shorter, wider leaves; wider apex angles; shorter leaf tips; brighter, pinkish bark color.

J. H. Hale by larger, more wrinkled leaves; more vigorous trees.

GOLDEN JUBILEE
(Fig. 25-2)

LEAF BLADE: *very broad* with the maximum width close to base; *very broad base* and *broadly acute apex angles*; *thick*, glossy leaf.

PETIOLE: *very short*, stout.

GLANDS: *few*.

GROWING TIP: greenish.

TREE: moderately vigorous; shoots moderately long.

DIFFERS FROM:

Elberta by broader leaves, broader base and apex angles; shorter petioles.

* These and similar numbers elsewhere in this publication, being in connection with color descriptions, indicate Ridgway's (32) color numbers.

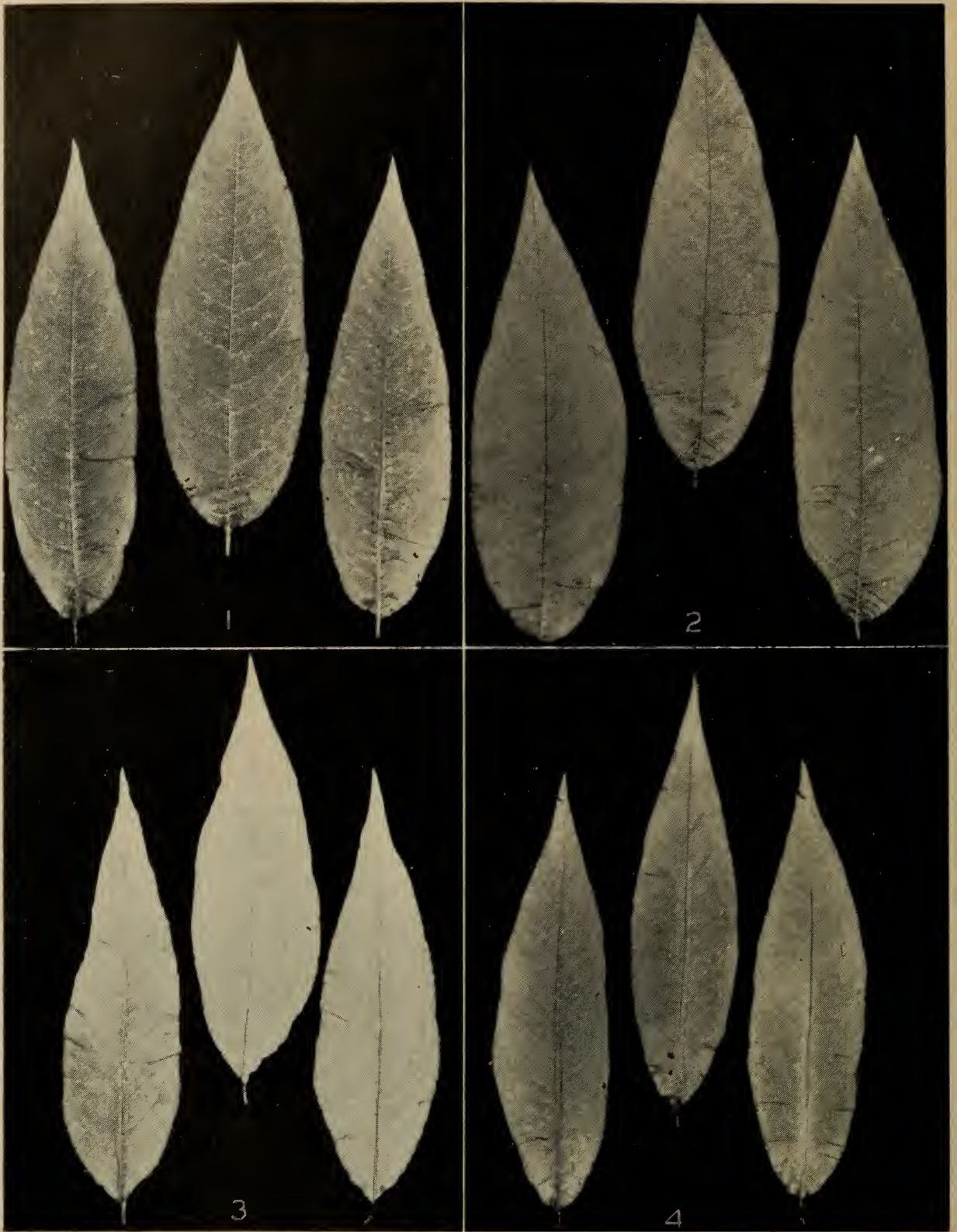


FIGURE 25. Typical leaves of four peach varieties.

1. ELBERTA;
3. J. H. HALE;

2. GOLDEN JUBILEE;
4. REDHAVEN.

J. H. HALE
(Fig. 25-3)

LEAF BLADE: relatively *small, broad with the maximum width close to base; base angle narrow* in relation to width of leaf blade; acute apex angle; leaf *light green, slightly wrinkled*.

PETIOLE: medium in size.

GLANDS: medium in number, yellow.

GROWING TIP: *yellowish*.

TREE: *small, heavily branched*.

SHOOTS: *stout, short, pinkish red on tips, rich in pink color* in older bark.

DIFFERS FROM:

Elberta by smaller, less wrinkled leaves; narrower base angle; smaller tree; more shoots; darker bark color.

REDHAVEN
(Fig. 25-4)

LEAF BLADE: rather *narrow with the maximum width relatively high; narrow base angle and acute apex angle; leaf yellowish green, relatively smooth*.

GLANDS: many to medium in number, greenish yellow.

GROWING TIP: *yellowish*.

TREE: moderately vigorous, heavily branched.

SHOOTS: well matured, bright red on tips, (5''k-1''m), *rich in yellow and pink colors in shaded and older bark*.

ROCHESTER
(Fig. 26-1)

LEAF BLADE: medium broad, with *short tip and broadly acute apex angle, slightly reflexed or straight* in midrib, slightly folded, slightly waved, relatively smooth, *dark green*.

PETIOLE: long in relation to leaf size.

GLANDS: medium to many in number.

GROWING TIP: *dark, green, sometimes with a pinkish tinge*.

TREE: very *vigorous, upright*.

SHOOTS: relatively short; tips dark red (1'm), *rich in dull red color* also in older bark.

BUDS: *large, heavily pubescent, very slightly pinkish*.

SOLO
(Fig. 26-2)

LEAF BLADE: fairly long, medium broad with *rather narrow base and acute apex angles, long tip; heavily reflexed in midrib*, fairly light in color, glossy.

SERRATIONS: *relatively coarse*.

GLANDS: medium in number.

GROWING TIP: greenish yellow, rather bright.

TREE: vigorous, heavily branched.

BARK COLOR: pinkish violet red (5''k) on tips; pink color in older or shaded parts.

DIFFERS FROM:

Elberta by narrower leaves; longer leaf tips; lighter leaf color; darker growing tips.
Veteran by narrower base angle; slighter wrinkling of the leaf.

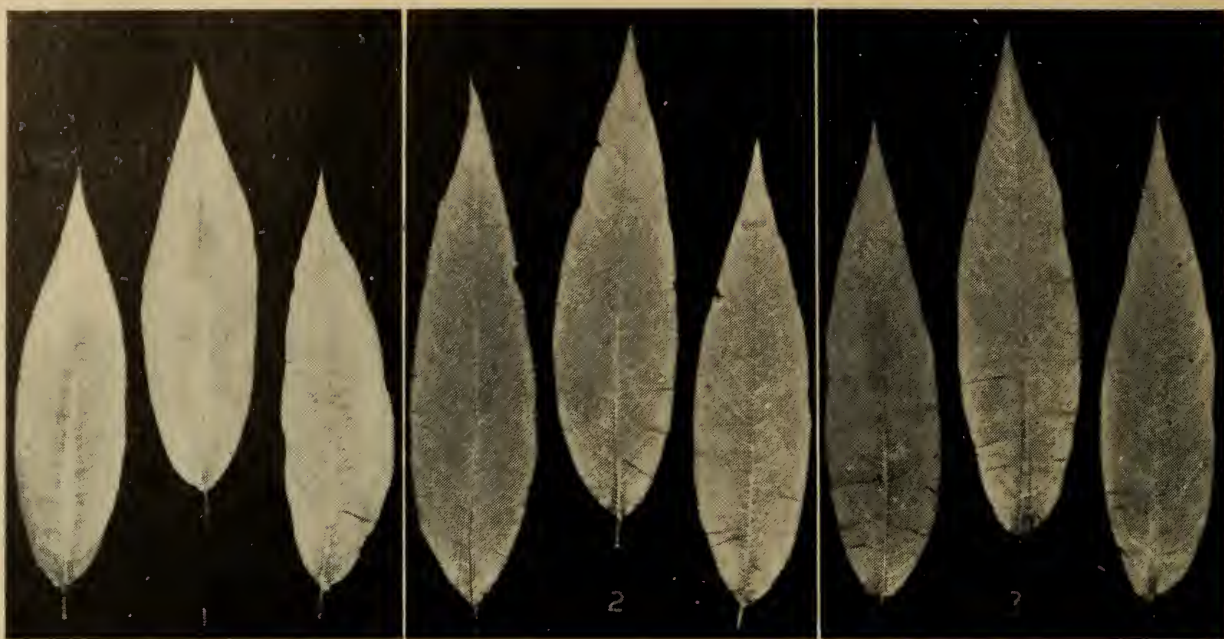


FIGURE 26. Typical leaves of three peach varieties.

1. ROCHESTER;

2. SOLO;

3. SPOTLIGHT.

SPOTLIGHT

(Fig. 26-3)

LEAF BLADE: *long, narrow, with narrow base and sharply acute apex angles, long tip; heavily reflexed in midrib, heavily waved, dark green.*

PETIOLE: *medium long.*

GLANDS: *medium to many.*

GROWING TIP: *green, frequently with brownish or pinkish tinge, bright.*

TREE: *vigorous, heavily branched; shoots mature late.*

BARK COLOR: *dark red (3''k-1''m) on tips; gray and green predominate in older bark.*

BUDS: *medium to many fruit buds; they are heavily pubescent; mostly one terminal bud on side shoots.*

DIFFERS FROM:

Valiant by slightly longer leaves with longer tips; wider base angle, narrower apex angle; heavier reflexion in midrib; shorter petioles; fewer glands.

VALIANT

(Fig. 27-1)

LEAF BLADE: *long, narrow, with maximum width relatively high; very narrow base angle; slight reflexion in midrib; surface relatively smooth.*

PETIOLE: *long.*

GLANDS: *many.*

GROWING TIP: *yellowish green.*

TREE: *vigorous, heavily branched.*

SHOOTS: *moderately long, thin, bright red on tips (1''k-3''k); shaded parts somewhat dull in color.*

BUDS: *large, appressed leaf buds; a few fruit buds; terminal buds on side shoots usually single.*

DIFFERS FROM:

Spotlight by narrower base angle, wider apex angle; shorter leaf tips; less waving and wrinkling; longer petioles; more glands.

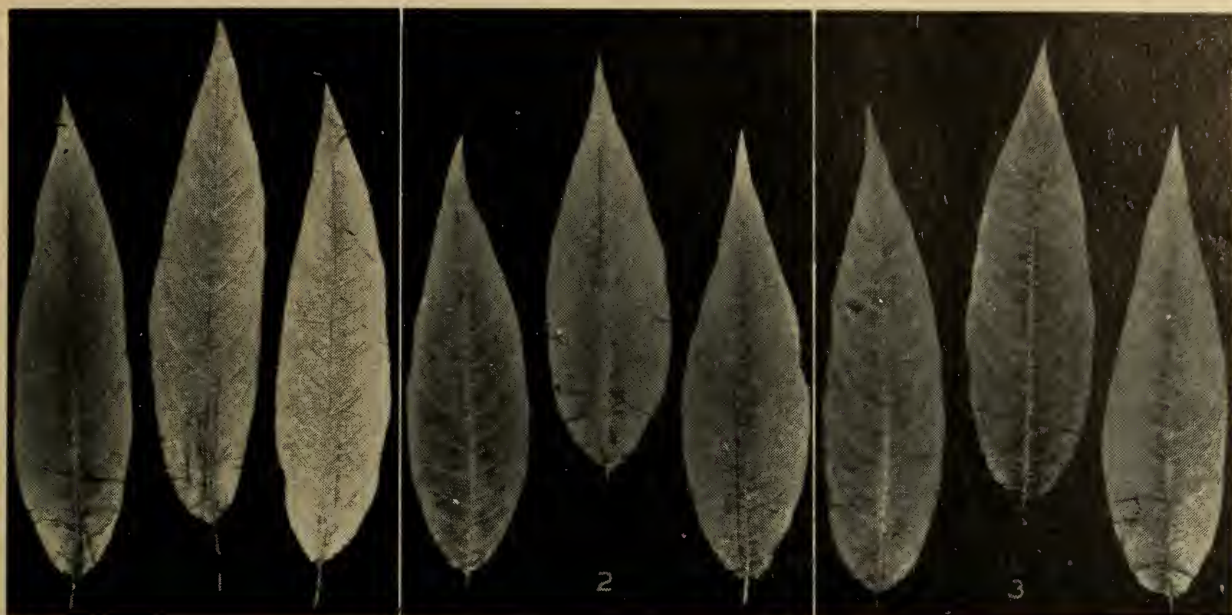


FIGURE 27. Typical leaves of three peach varieties.

1. VALIANT;

2. VEDETTE;

3. VETERAN.

VEDETTE

(Fig. 27-2)

LEAF BLADE: *short, broad*, with acute apex angle, *slightly reflexed* in midrib, slightly folded, slightly wrinkled; *base angle rather narrow* in relation to width of the blade.

GLANDS: medium to few in number.

GROWING TIP: greenish yellow.

TREE: *vigorous, high*, moderately branched.

SHOOTS: rather long, bright red in tips (3''k-1''k); older bark light green, mixed with yellow and pink.

BUDS: *many fruit buds on mature twigs, several terminal buds on mature side shoots.*

DIFFERS FROM:

Elberta by slightly shorter leaves; less wrinkling and waving; less reflexion in midrib; more vigorous growth; darker bark color.

Veteran by shorter and slightly wider blade; shorter and wider leaf tips; less wrinkling and reflexion; longer petioles.

VETERAN

(Fig. 27-3)

LEAF BLADE: *long*, medium broad with the *maximum width relatively low, long leaf tip*; leaf heavily waved and wrinkled, rather heavily reflexed.

PETIOLE: *short.*

GROWING TIP: yellowish green.

TREE: moderately vigorous.

SHOOTS: *medium short, rather stout*, well matured; dull red (5'''i-5''m) on tips, greenish brown or grayish in older bark.

DIFFERS FROM:

Vedette by longer, slightly narrower leaves, heavier reflexion and wrinkling, long leaf tips; slightly narrower apex angles; short petioles.

Elberta by longer, slightly narrower leaves; longer leaf tips; narrower apex angles.

PEAR VARIETIES

Southwick et al. (42) and Crane and Lewis (6) have thoroughly described characteristics useful for identification of pear varieties and presented descriptions of many varieties. Brief comments on some varieties or useful characters in identification are given by Bunyard (4), Upshall (49), and Shoemaker (39).

Valuable Characteristics

Distinction should be made between the two types of pear leaves that are usually found on one-year-old nursery shoots: (1) the first or the lowest leaf at each bud and (2) the spur leaves, found at fully developed spurs and at larger "buds" with extended bases; these "buds" could be considered as semi-developed spurs (Fig. 28). Only the first type of leaf is considered in the following descriptions.

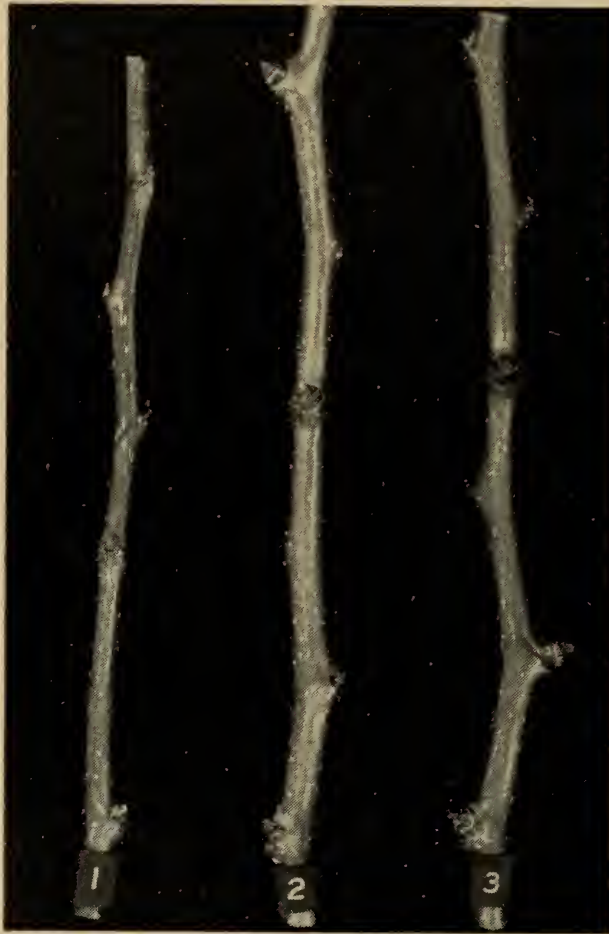


FIGURE 28. Buds and semi-developed spurs in pear.
Bartlett.

1. Shoot with lateral buds;
- 2 and 3. Shoots with semi-developed spurs.

LEAF BLADE

<i>Size</i>	small—Flemish Beauty medium—Bartlett large—Bosc
<i>Shape</i>	broadly oval—Bartlett oval-ovate—Flemish Beauty
<i>Apex</i>	broad, abrupt—Bartlett broadly acute, slightly abrupt—Bosc tapering—Flemish Beauty
<i>Tip</i>	length: short—Comice medium—Bosc long—Flemish Beauty reflexion: heavy—Anjou moderate—Bartlett slight—Flemish Beauty
<i>Reflexion</i> (Fig. 29).....	slight—Flemish Beauty moderate—Bartlett heavy—Anjou
<i>Folding</i>	extent: heavy—Bartlett slight—Flemish Beauty shape: U-folded—Bartlett V-folded—Old Home
<i>Waving</i>	very slight—Bartlett slight—Old Home moderate—Comice heavy—Anjou
<i>Curving of midrib</i>	moderate—Anjou slight—Bosc none—Bartlett
<i>Color</i>	grayish light green—Old Home medium green—Bartlett dark green—Flemish Beauty
<i>Serrations</i>	very sharp, regular—Bartlett very coarse, irregular—Hardy irregular, some margins entire—Bosc
<i>Pubescence</i> (on lower surface).....	very slight to none—Bosc slight—Bartlett moderate—Old Home

PETIOLE

<i>Size</i>	short, stout—Hardy medium in size—Bartlett long, slender—Flemish Beauty
<i>Color</i>	green—Hardy slightly reddish—Comice, Anjou bright red—Bosc

GLANDS

<i>Position</i>	mostly on blade—Bartlett on petiole and blade—Old Home
<i>Number</i>	abundant—Comice medium—Bosc few—Anjou

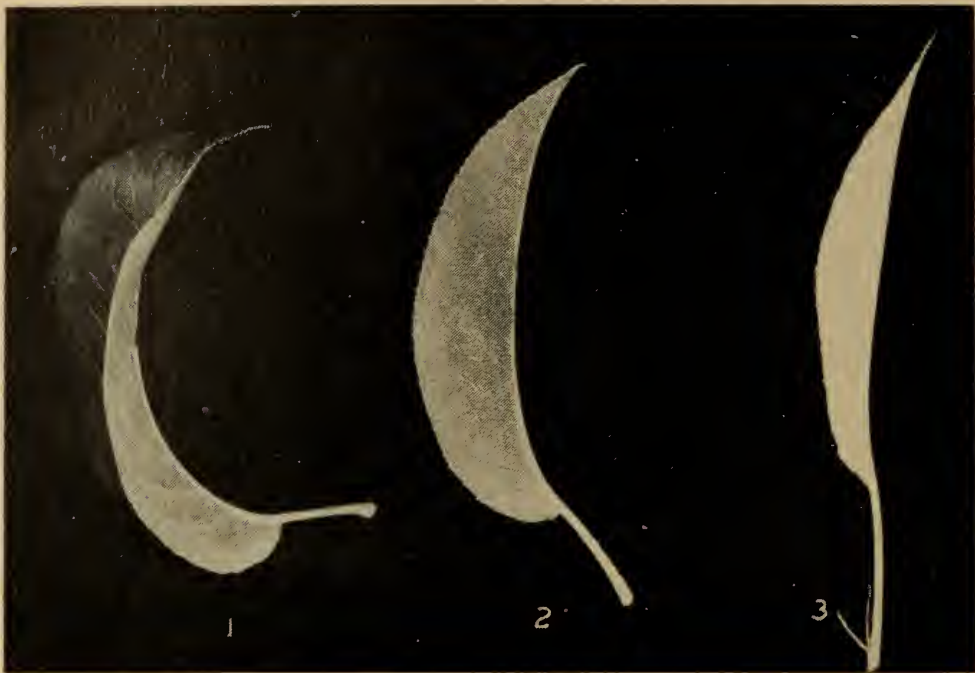


FIGURE 29. Extent of reflexion of leaf midrib in pear.

- | | |
|-----------------------------------|---------------------------------|
| 1. ANJOU—heavy; | 2. BARTLETT—moderate to slight; |
| 3. FLEMISH BEAUTY—slight to none. | |

GROWING TIP

*Pubescence of shoot and
tip leaves*.....

slight—Bosc
moderate—Bartlett
heavy—Old Home

Color of tip leaves.....

brownish—Flemish Beauty
brownish with yellowish and green—Bartlett
brownish with pink—Old Home

DORMANT SHOOT

Length.....

moderately short—Comice
moderately long—Anjou
very long—Old Home

Length of internodes....

long—Bosc
short—Comice

Stoutness.....

stout—Anjou
slender—Flemish Beauty

Pubescence.....

moderate—Old Home
slight—Bartlett
none—Bosc

Color.....

yellowish brown—Bartlett
greenish brown—Anjou
grayish brown—Hardy
dark reddish brown—Flemish Beauty

*Number of side shoots
and spurs*.....

few to medium—Bosc
medium—Anjou
many, short—Comice

LENTICELS

<i>Size</i>	medium—Bartlett large—Hardy
<i>Raising</i>	flush—Bartlett slightly raised—Bosc

BUDS

<i>Size</i>	large—Hardy, Bosc medium—Anjou
<i>Pubescence</i>	moderate—Anjou slight—Bartlett none—Bosc

Brief Descriptions

ANJOU

(Fig. 30-1)

LEAF BLADE: *very heavily reflexed* and moderately curved in midrib, *heavily U-folded, heavily waved*, semi-glossy, yellowish green.

SERRATIONS: medium sharp, single, irregular; some portions of margin entire.

PETIOLE: rather slender, partly pubescent, slightly *pinkish*; leaf pose drooping.

GLANDS: on petiole and blade, *few to medium* in number.

GROWING TIP: rather heavily *pubescent*, bright brownish to pinkish.

SHOOT: rather stout, moderately pubescent, dull brown on tip, *olive brown to green* at base; long internodes.

LENTICELS: *conspicuous*, flush or slightly raised.

DIFFERS FROM:

Comice by narrower, more curved leaves; fewer glands; pink color in petiole and in growing tip.

BARTLETT

(Fig. 30-2)

LEAF BLADE: oval, abrupt in apex, *heavily U-folded, even in margin*, glossy, smooth, dark yellowish green.

SERRATIONS: *sharp, fine, regular*, single.

PETIOLE: medium in size, mostly green; leaf pose drooping.

GLANDS: almost exclusively on blade, many.

GROWING TIP: moderately pubescent, green to yellowish brown.

SHOOT: rather slender, zigzag, slightly pubescent, *yellowish brown, bright*; many spurs on current year's growth.

LENTICELS: russet to gray, flush, *inconspicuous*.

DIFFERS FROM:

Old Home, in winter characteristics, by slenderer shoots; many spurs; brighter bark with more yellow color; smaller lenticels.

Bosc
(Fig. 30-3)

LEAF BLADE: *large, oval with broadly acute apex, heavily reflexed and slightly curved in midrib, coarsely waved, very slightly pubescent.*

SERRATIONS: *sharp, irregular; some leaves with almost entire margins.*

PETIOLE: *fairly long and slender, green with bright red tinge.*

GLANDS: *on petiole and blade, medium in number.*

GROWING TIP: *slightly pubescent, brownish.*

SHOOT: *long, straggling, zigzag, glabrous, dark brown on tip, brown to grayish brown at base; long internodes.*

LENTICELS: *large, grayish russet, raised.*

BUDS: *rather large, acute, glabrous; bud-shoot angle medium to wide; bud supports prominent.*



FIGURE 30. Typical leaves of three pear varieties.

1. ANJOU;

2. BARTLETT;

3. BOSC.

COMICE

(Fig. 31-1)

LEAF BLADE: broadly oval; apex broad and abrupt, *tip short, twisted*, and reflexed; midrib heavily reflexed; leaf moderately folded, *coarsely waved*.

SERRATIONS: deep, medium coarse, single and double.

PETIOLE: somewhat *slender*, pubescent, *slightly reddish*.

GLANDS: on petiole and blade, medium to many.

SHOOT: rather short and *slender, zigzag*, light brown to olive brown; *heavily spurred*.

BUDS: relatively large, *acute*, somewhat wide-angled; bud supports prominent.

DIFFERS FROM:

Anjou by broader leaves; less curving in midrib; more glands; less pink color in petiole and growing tip.

Hardy by shorter leaf and leaf tip; heavier waving in margin; less pubescence on leaves and shoots; brownish growing tips; slender shoot; acute buds; lighter bark color.

FLEMISH BEAUTY

(Fig. 31-2)

LEAF BLADE: *small with relatively narrow base and apex, slightly reflexed*, moderately V-folded, *dark green, glossy, smooth*.

SERRATIONS: sharp, coarse, irregular; some leaves with partly entire margins.

PETIOLE: rather long and slender; leaf pose spreading.

GROWING TIP: moderately pubescent, *brownish*.

SHOOT: long, slender, slightly pubescent; bark color *dark reddish brown, uniform*.

LENTICELS: *conspicuous, flush*.

HARDY

(Fig. 31-3)

LEAF BLADE: medium to large, broadly oval, *heavily reflexed in midrib and tip*, moderately to heavily V-folded, slightly to moderately pubescent.

SERRATIONS: sharp, *deep, very coarse, irregular*.

PETIOLE: *moderately short, pubescent, green*; leaf pose drooping.

GLANDS: on petiole and blade, medium to many.

SHOOT: relatively *short*, rather dark brown on tips, *olive brown* at bases; *many spurs* on current year's growth.

LENTICELS: *numerous, conspicuous*, russet to gray, flush.

BUDS: *large*, relatively pubescent; bud-shoot angle medium to wide; bud supports prominent.

DIFFERS FROM:

Comice by longer, more reflexed and pubescent leaves, longer leaf tips; coarser, more irregular serrations; stouter shoot; darker brown bark; more rounded buds.

OLD HOME

(Fig. 31-4)

LEAF BLADE: broadly oval, moderately *V-folded*, slightly waved, moderately thick, *grayish green*, moderately pubescent, somewhat *dull*.

PETIOLE: rather slender, pubescent, yellowish and pinkish; leaf pose drooping and spreading.

GROWING TIP: heavily pubescent, *pinkish gray*.

SHOOT: *very long, moderately pubescent*, dark brown on tips, *grayish brown* at bases.

LENTICELS: moderately numerous, *rather large*, flush.

DIFFERS FROM:

Bartlett, in winter characteristics, by more vigorous growth; fewer spurs; heavier pubescence on tips; more red, less yellow in bark color; larger lenticels.

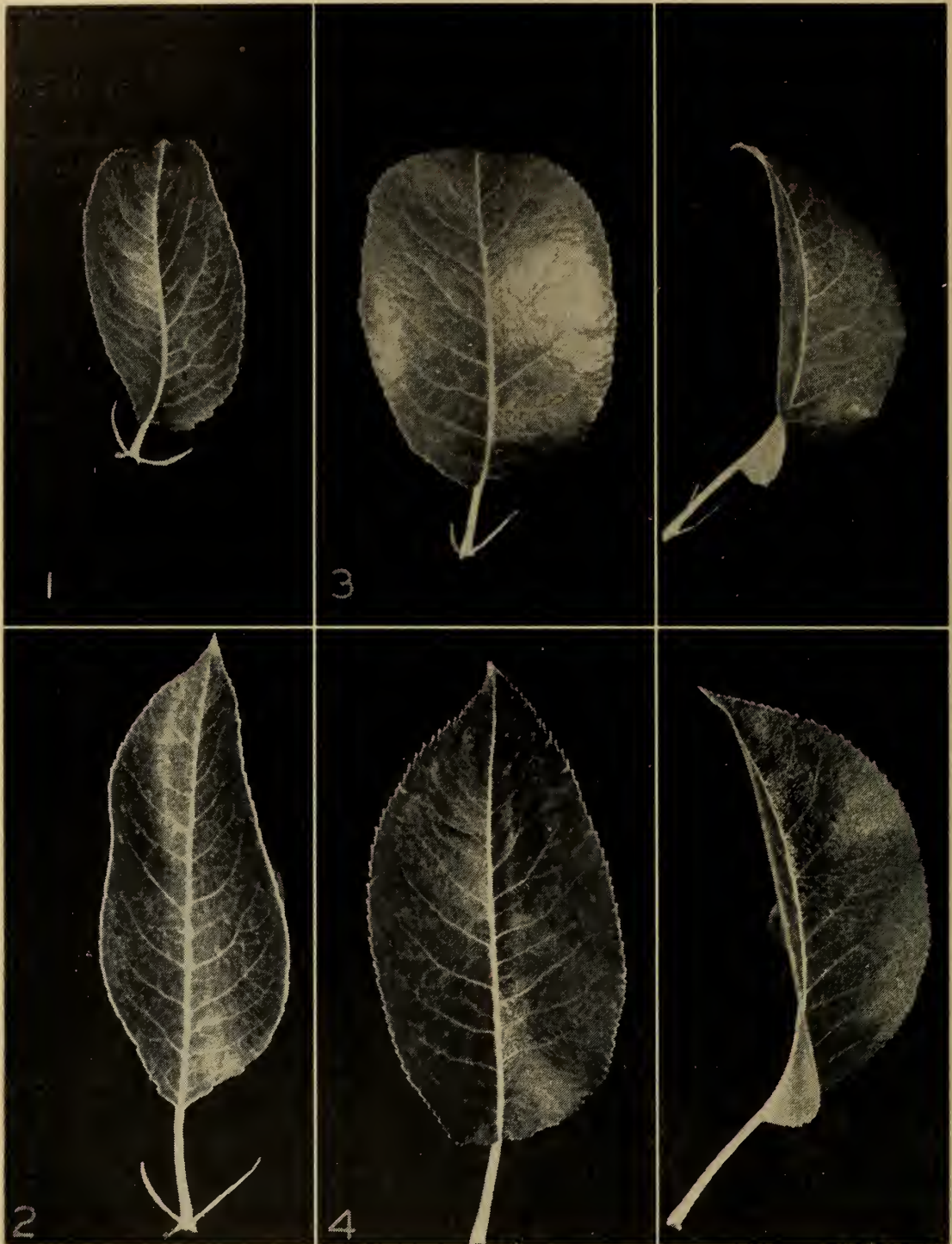


FIGURE 31. Typical leaves of four pear varieties.

1. COMICE;

2. FLEMISH BEAUTY;

3. HARDY; with side view.

4. OLD HOME; with side view.

Key to Pear Varieties

SUMMER CHARACTERISTICS

- A Leaf midrib moderately curved; leaf glands few to medium. Anjou
- AA Leaf midrib slightly curved; leaf glands moderately numerous; some margins entire. Bosc
- AAA Leaf midrib straight; leaf glands many to moderately numerous
 - B Leaf base broadly acute, leaf flat or slightly folded. Flemish Beauty
 - BB Leaf base rounded, leaf moderately to heavily folded
 - C Serrations fine, regular, single
 - D Leaf heavily U-folded, glossy, slightly pubescent. Bartlett
 - DD Leaf moderately V-folded, dull, heavily pubescent. Old Home
 - CC Serrations deep, coarse
 - D Leaf heavily folded, grayish green, pubescent; serrations irregular, very coarse; growing tip greenish. Hardy
 - DD Leaf moderately folded, light green, nearly glabrous; serrations coarse, growing tip brownish. Comice

WINTER CHARACTERISTICS

- A Shoots glabrous or slightly pubescent; lenticels prominently raised. Bosc
- AA Shoots slightly pubescent
 - B Bark dark reddish brown. Flemish Beauty
 - BB Bark olive brown, dull; lenticels numerous; buds large. Comice
 - BBB Bark yellowish brown, bright; lenticels moderately numerous; buds medium large. Bartlett
- AAA Shoots moderately pubescent
 - B Lenticels slightly raised, conspicuous; bark olive to brownish green. Anjou
 - BB Lenticels flush
 - C Shoot moderately long, stout, with many spurs; buds large. Hardy
 - CC Shoot very long with a few spurs; buds medium in size. Old Home

PLUM VARIETIES

There are several publications on identification of plum varieties. Southwick and French (41) have presented thorough discussions of characteristics valuable in identification and have given descriptions of many European, Damson, Japanese, and hybrid plum varieties. Alderman and Shoemaker (1) have described leaf characteristics useful in identification, Bunyard (4) has discussed some characteristics of dormant trees, and Upshall (49) has given brief descriptions of some varieties.



FIGURE 32. Characteristic pose and folding of leaves in the strains of Italian Prune.
1. ITALIAN—heavily drooping, back-folded, large leaves;
2. ITALIAN (GREATA)—mostly spreading, slightly to moderately folded leaves.

Valuable Characteristics

In discussing characteristics of plum varieties, early strains of Italian Prune are frequently mentioned, mostly in comparison with the original Italian Prune. Of the several early strains of Italian Prune, reference is made here only to the following: Italian (Greata), Italian (Richards), and Italian (De Maris).

LEAF BLADE	
Size.....	large—Italian medium large—early strains of Italian
Base.....	rounded—Peach Plum broadly acute to rounded—early strains of Italian
Tip.....	broadly acute—Italian long—Bradshaw medium long—Italian short—Peach Plum

<i>Folding</i>	moderate U-folding—early strains of Italian (Fig. 32) slight saucer-folding—Italian (Fig. 32) heavy reverse-saucer-folding—Bradshaw slight reverse-saucer-folding—Yakima
<i>Waving</i>	extent: very heavy—Bradshaw heavy—Green Gage moderate—Italian slight—Peach Plum coarseness: coarse—Green Gage medium to fine—Italian mostly fine—Yellow Egg
<i>Color</i>	light green—Yellow Egg medium green—Italian dark green—Bradshaw bluish green—Peach Plum
<i>Serrations</i>	sharpness: medium sharp—Yellow Egg dull—Peach Plum depth: very deep—Bradshaw medium deep—Italian medium shallow—Yakima regularity: fairly regular—Yakima irregular—Bradshaw individual serrations: mostly single—Yellow Egg mostly double—Green Gage triple—Italian
<i>Glossiness</i>	glossy—Bradshaw semi-glossy—Italian dull—Peach Plum

PETIOLE

<i>Pubescence</i>	present on both sides—Italian absent on upper side—Green Gage
<i>Color</i>	predominantly green—Italian pinkish—Yellow Egg bright red—Yakima
<i>Leaf pose</i>	mostly spreading—early strains of Italian (Fig. 32) drooping—Italian (Fig. 32) excessively drooping—Bradshaw

GLANDS

<i>Number, size, and position</i>	1 to 2, small, mostly on blade—Green Gage 1 to 2, medium, mostly on petiole—Italian 2, large, on petiole—Yakima
---	---

GROWING TIP

*Color of shoot slightly
below growing tip.....* pinkish—Yellow Egg
brownish—Italian
reddish violet—Peach Plum

DORMANT SHOOT

Stoutness..... stout—Peach Plum
slender—Yellow Egg
Direction..... straight—Bradshaw
slightly curved—Yellow Egg
straggling—Italian
Scarf skin..... heavy—Italian
moderate—Green Gage
light—Yellow Egg
Color of bark (at tips)... violet brown—Peach Plum
light vinaceous brown—Green Gage
pinkish brown—Yellow Egg
Number of side shoots... many—Peach Plum
medium—Italian (Richards)
few—Italian, Bradshaw

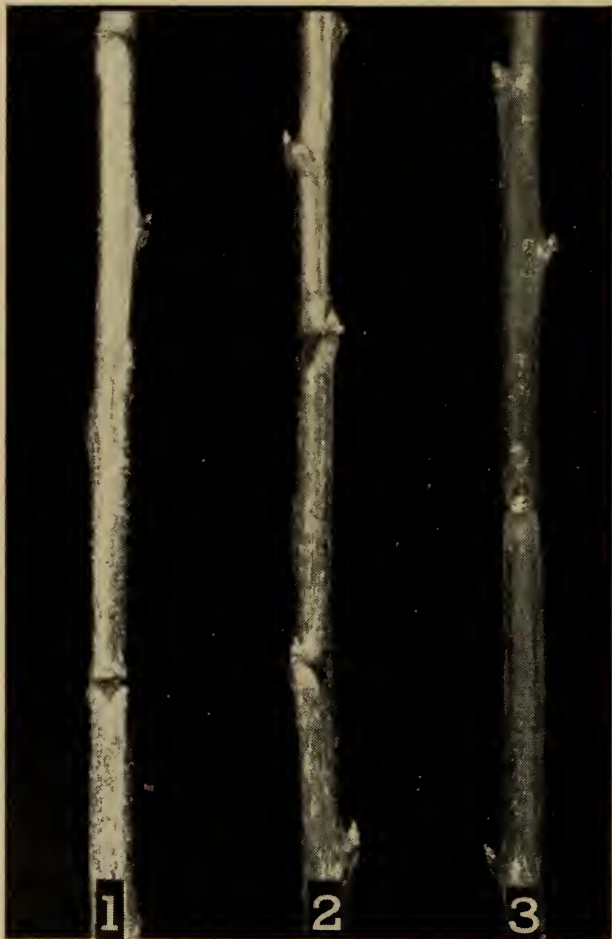


FIGURE 33. Size, shape and pose of buds in plum.
1. GREEN GAGE—small, wide, acute, narrow-angled or appressed to shoot;
2. YAKIMA—medium and large, very acute, narrow-angled;
3. PEACH PLUM—large, blunt buds; bud-shoot angle medium and wide.

BUDS

<i>Size</i>	large—Peach Plum medium—Bradshaw small—Green Gage
<i>Shape</i>	broad, blunt—Peach Plum broad, acute—Green Gage, Bradshaw narrow, acute—Yakima
<i>Bud-shoot angle</i>	medium to wide—Peach Plum narrow to medium—Italian narrow—Yellow Egg

(Buds of Green Gage, Yakima, and Peach Plum shown in Fig. 33.)

<i>Bud support</i>	prominent—Green Gage slightly elevated—Bradshaw
--------------------------	--

Brief Descriptions

BRADSHAW

(Fig. 34-1)

LEAF BLADE: broadly oval with long, twisted tip; *heavily reverse-saucer-folded, very heavily waved*, rigid, glossy, very heavily wrinkled and pebbled.

SERRATIONS: medium dull, *very deep and coarse*, irregular.

PETIOLE: medium in size; *leaf pose heavily drooping*.

SHOOT: *very long, slender, straight, dark livid brown*; scarf skin moderate to light.

LENTICELS: numerous, slightly raised, grayish russet

BUDS: *narrow, acute, narrow-angled; bud supports weak*.

GREEN GAGE

(Fig. 34-2)

LEAF BLADE: broadly oval to obovate, with broad and abrupt apex, reflexed in midrib, slightly saucer-folded, heavily waved, thick, *light green, glossy, wrinkled and pebbled*.

SERRATIONS: dull, medium coarse, double and triple.

PETIOLE: rather short and stout, mostly red or pinkish, mixed with green.

GLANDS: on petiole and blade, rather small, *mostly 1 to 2, frequently absent*.

GROWING TIP: light brown or reddish; *tip of shoot pinkish*.

SHOOT: *long, slender, vinaceous brown, tip pinkish*.

LENTICELS: small, russet, flush, inconspicuous.

BUDS: relatively *small, acute, narrow-angled or appressed to shoot*; frequently in compact groups of 3; *bud supports prominent*, swollen tissue above the buds.

The type of Green Gage described here is that which is most commonly grown by British Columbia nurseries. This type agrees closely with the published description of the variety Bavay (41). The latter variety, according to Hedrick (18) and Southwick and French (41), is usually called Green Gage by most of the American nurserymen.



FIGURE 34. Typical leaves of four plum varieties.

1. BRADSHAW;
3. ITALIAN;

2. GREEN GAGE;
4. ITALIAN (RICHARDS).

ITALIAN PRUNE

(Fig. 34-3)

LEAF BLADE: *obovate with narrow base, slightly saucer-folded; reflexed mostly at the base of the blade, heavily in large leaves; surface glossy.*

PETIOLE: medium stout, pubescent; *leaf pose heavily drooping.*

GROWING TIP: light reddish brown, *bright.*

SHOOT: long, rather slender, *straggling*, dark vinaceous brown on upper portion, *grayish and greenish brown at base; heavy scarf skin; a few side shoots.*

BUDS: relatively small, acute; bud-shoot angle narrow to medium; bud supports prominent.

DIFFERS FROM:

Early strains—De Maris, Greata, and Richards—by larger, obovate leaves with narrower base angle; heavier reflexion, drooping leaf position, less folding, brighter color in growing tip; slightly brighter color of bark in upper portion of mature shoot; fewer side branches from current year's growth.

EARLY STRAINS OF ITALIAN PRUNE—DE MARIS, GREATA, AND RICHARDS

(Fig. 34-4)

No appreciable differences have been found between these early strains of Italian Prune. Differences between the early strains and the original Italian Prune are slight; therefore any differences that are observed should be considered as reliable only if the trees are grown under comparable conditions.

Table 2.—A Comparison between Italian and its Early Strains

Plant character	Italian	De Maris, Greata, & Richards
Leaf size.....	medium to large	medium
Base of leaf.....	broadly acute	broadly acute to rounded
Length of petiole.....	medium to long	medium
Reflexion in midrib.....	slight, some heavy	slight
Folding of leaf.....	slight	moderate
Pose of leaf.....	heavily drooping	drooping to spreading
Color of growing tips.....	bright	somewhat dull
Color of bark, upper portion.....	5''' k	7''' k to 9''' k
Side shoots.....	few	few to medium

Of the three early strains, Richards shows the greatest, De Maris the smallest deviation from the original Italian type.

PEACH PLUM

(Fig. 35-1)

LEAF BLADE: oval to obovate; *apex very broad, slightly abrupt; tip short, wide; leaf slightly saucer-folded, coarsely waved, dark bluish green, dull.*

SERRATIONS: *dull, coarse*, single and double.

PETIOLE: rather short, stout, partly pubescent, wide-angled.

GLANDS: mostly on petiole, *usually 2, large, with depressed centres, green.*

SHOOT: long, rather stout, *dark bluish red*, uniform in color, *heavily branched.*

BUDS: *large, blunt; bud-shoot angle medium to wide.*

DIFFERS FROM:

Yakima, in winter characteristics, by lighter bark color; many wide-angled side branches; blunt, relatively wide-angled buds.

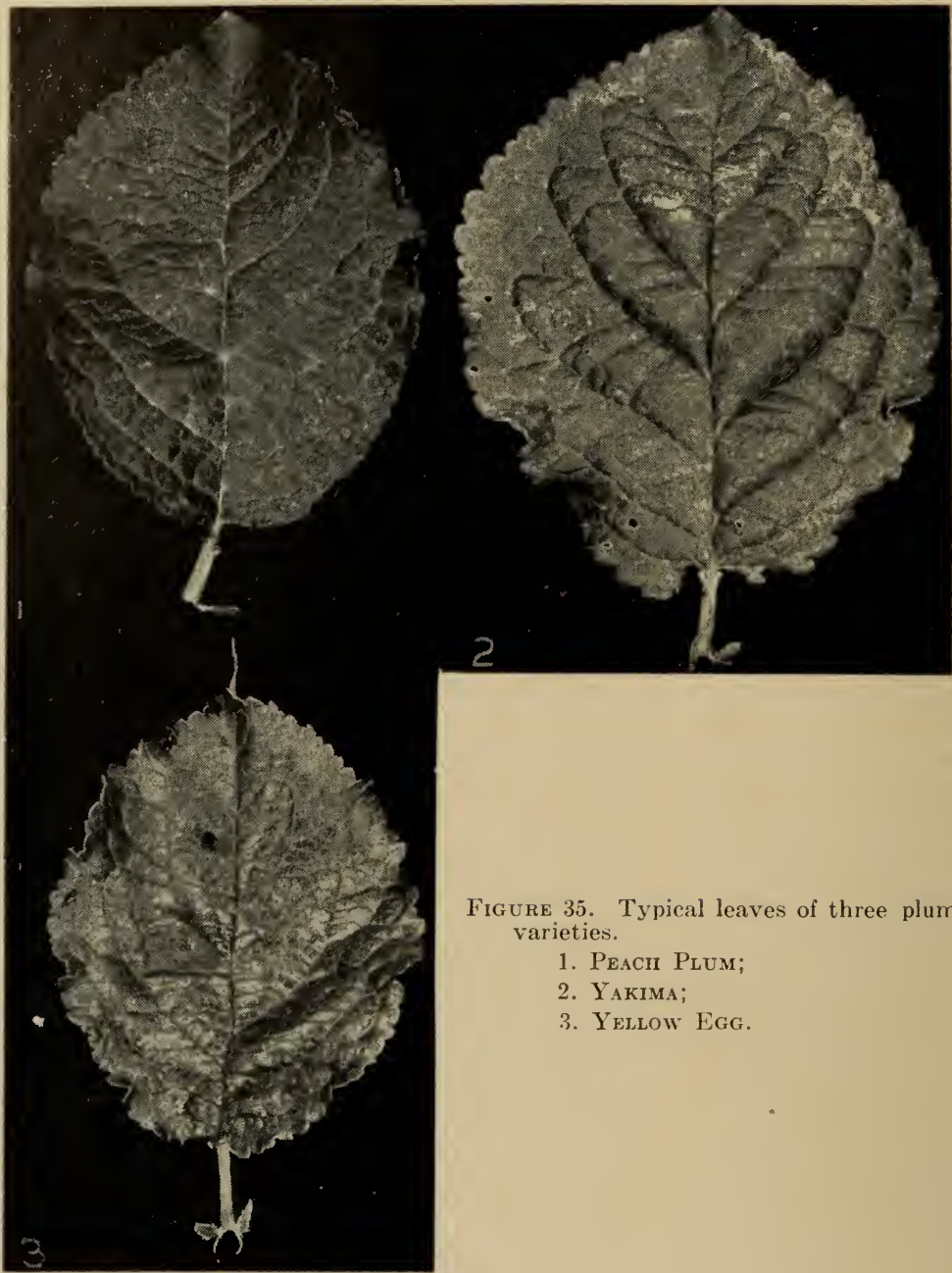


FIGURE 35. Typical leaves of three plum varieties.

1. PEACH PLUM;
2. YAKIMA;
3. YELLOW EGG.

YAKIMA
(Fig. 35-2)

LEAF BLADE: large, broadly oval with reflexed and twisted tip; mostly *reverse-saucer-folded*, dark green, heavily wrinkled and pebbled.

PETIOLE: stout, wide, pubescent, mostly with bright red tinge.

GLANDS: on petiole, *usually 2*, medium large, green.

SHOOT: long, fairly slender, straight, *dark bluish red*, uniform in color.

LENTICELS: numerous, conspicuous, flush or slightly raised.

BUDS: rather *large*, narrow, *very acute*, relatively narrow-angled.

DIFFERS FROM:

Peach Plum in winter characteristics by darker bark color, fewer side branches and narrower branch angle; longer, acute, relatively narrow-angled buds.

YELLOW EGG*

(Fig. 35-3)

LEAF BLADE: broadly oval with broad, abrupt apex and rather *long, twisted tip*; mostly flat, *heavily waved*, light green, glossy, heavily wrinkled; *stipules large*.

PETIOLE: wide-angled, pinkish.

GLANDS: mostly on blade, yellowish, 1 to 2, *some leaves eglandular*.

GROWING TIP: leaves yellowish, *shoot pink*.

SHOOT: very long, *slender, pinkish red to light brown*; light scarf skin; *long internodes*; a few side shoots.

BUDS: relatively *small, acute*, slightly pubescent, narrow-angled.

Key to Plum Varieties

SUMMER CHARACTERISTICS

- A Glands mostly on blade, 1 to 2, frequently absent
 - B Midrib moderately reflexed; leaf tip medium to short; stipules medium..... Green Gage
 - BB Midrib slightly reflexed; leaf tip long, twisted; stipules large to medium..... Yellow Egg
- AA Glands on petiole and blade, mostly 2, medium in size
 - B Leaf slightly folded; foliage heavily drooping..... Italian Prune
 - BB Leaf moderately folded; foliage spreading or drooping..... Early Strains of Italian Prune
- AAA Glands on petiole, normally 2, medium to large
 - B Leaf heavily back-folded, very heavily waved; serrations very coarse. Bradshaw
 - BB Leaf slightly back-folded, slightly waved, fine waves; surface glossy.. Yakima
 - BBB Leaf slightly saucer-folded, slightly waved, coarse waves; surface dull. Peach Plum

WINTER CHARACTERISTICS

- A Bark grayish brown in middle portion of shoot; scarf skin very heavy.. Italian Prune
- AA Bark dark violet in middle portion of shoot
 - B Buds large, blunt, bud-shoot angle medium to wide..... Peach Plum
 - BB Buds medium to large, very acute, bud-shoot angle medium narrow.. Yakima
- AAA Bark reddish brown in middle portion of shoot; shoot perfectly straight.. Bradshaw
- AAAA Bark brown to light brown in the middle portion of shoot
 - B Scarf skin moderate to light; bark brown; tip pink..... Green Gage
 - BB Scarf skin light to moderate; bark light brown; shoot straggling.... Yellow Egg

*Yellow Egg is also used as a clonal rootstock, under the name of Pershore.

ROOTSTOCKS

This section deals mainly with clonal rootstocks of apple, cherry, and plum. Short descriptions and methods of identification of stocks by both their aerial parts and roots are given.



FIGURE 36. Base of leaf and size of stipules in apple rootstocks.

1. MALLING I—base rounded to cordate; stipules large;
2. MALLING XVI—base rounded; stipules medium in size;
3. MALLING II—base broadly acute; stipules small.

Apple Rootstocks

Hatton (16), Shaw (36), Floor and Zweede (11), and Maurer (24) have presented thorough descriptions of the most widely known apple clonal rootstocks. Brief descriptions of apple clonal stocks are given in a bulletin issued by the Ministry of Agriculture and Fisheries [England] (28). Tydeman (46) studied the variations in leaf characters of apple stocks, Lincoln and Amatt (23) studied the root formation of apple layers. Short descriptions of roots of some apple clonal rootstocks are given by Hatton (16). In the following discussions, the names of the Malling rootstocks, Malling I, Malling II, etc., are abbreviated to M.I, M.II, etc.

The differences in most of the plant characters are greater in apple rootstocks than in apple varieties, and usually only a few characters are necessary to identify the rootstock. The most valuable characters are briefly noted.

LEAF BLADE

- | | |
|----------------------------|--|
| <i>Shape</i> | broadly oval to roundish—M. VII
oval to ovate— <i>Malus robusta</i> No. 5
ovate—M. XVI |
| <i>Base</i> (Fig. 36)..... | cordate—M. I
rounded—M. XVI
rounded to broadly acute—M. II |

<i>Folding</i>	saucer- or U-folded—M. IX flat or reverse-saucer-folded—M. I
<i>Serrations</i>	sharpness: very sharp—M. I medium sharp—M. IX size: deep, coarse—M. IX shallow, fine— <i>Malus robusta</i> No. 5
<i>Surface</i>	glossy—M. IX semi-glossy—M. II dull—M. XVI
<i>Stipules</i> (Fig. 36).....	large—M. I medium—M. XVI small—M. II

GROWING TIPS

<i>Color of tip leaves</i>	fresh green—M. XVI yellowish or whitish green—M. II brownish—M. IV brownish yellow—M. I
----------------------------------	--

DORMANT SHOOTS

<i>Length</i>	long—M. VII short—M. IV
<i>Stoutness</i>	slender—M. VII moderately stout—M. XVI stout—M. II
<i>Internodes</i>	short—M. II medium—M. VII relatively long— <i>Malus robusta</i> No. 5
<i>Pubescence</i>	very heavy—M. IX moderate—M. VII light— <i>Malus robusta</i> No. 5
<i>Color of bark</i> (close to base).....	dark brown with slight gray—M. II pinkish-grayish brown—M. IX grayish brown—M. IV
<i>Lenticels</i>	number: numerous—M. II moderate in number—M. I relatively few—M. IX conspicuousness: very conspicuous—M. II moderately conspicuous— M. XVI inconspicuous—M. IV
<i>Buds</i>	size and shape: large, narrow—M. II medium large, broad—M. VII pubescence: heavy—M. IX moderate—M. VII light— <i>Malus robusta</i> No. 5
<i>Side shoots and spurs</i> ...	abundant— <i>Malus robusta</i> No. 5 numerous—M. XVI moderately numerous—M. I relatively few—M. IX

ROOTS

<i>Initiation of roots at the stem piece</i>	in great number (in burr knots)—M. I in moderate number at each bud—M. IV a few at each bud—M. II
--	---

<i>Number of main roots</i> . . .	numerous— <i>Malus robusta</i> No. 5 moderate in number—M. VII relatively few—M. II
<i>Size of main roots</i>	coarse—M. II fine—M. IV
<i>Amount of fibre roots</i> . . .	very fibrous— <i>Malus robusta</i> No. 5 fibrous—M. VII moderately fibrous—M. II
<i>Brittleness</i>	very brittle—M. IX moderately brittle—M. IV relatively tough—M. XVI
<i>Thickness of bark</i>	very thick—M. IX medium thick to thick—M. VII medium thick— <i>Malus robusta</i> No. 5
<i>Lenticels</i>	numerous, conspicuous, large—M. II few, inconspicuous, small—M. IV

MALLING I

(Fig. 37-1)

LEAF BLADE: *large*, ovate to broadly oval, usually flat, dark green, semi-glossy, *heavily wrinkled*; *stipules large*.

SERRATIONS: *very sharp*, somewhat coarse, single and double.

PETIOLE: *short*, rather stout, slightly red at base.

GROWING TIP: *brownish and yellowish green*.

SHOOT: long, rather stout, *zigzag*, brown with green patches.

LENTICELS: moderately conspicuous, russet to gray, slightly raised.

BUDS: large, appressed to shoot; *bud supports prominent with well-developed central ridges*.

ROOTS: initiated at buds in burr knots; root system well developed with many small and medium-sized roots and some coarse laterals; roots very fibrous, tough; lenticels inconspicuous.

MALLING II

(Fig. 37-2)

LEAF BLADE: oval with relatively *narrow base*, moderately U-folded, somewhat dark green, *semi-glossy to dull*, rather heavily pubescent; *stipules small*.

SERRATIONS: medium dull, single and double.

PETIOLE: relatively narrow-angled, red at base.

GROWING TIP: *heavily pubescent*, grayish or yellowish green.

SHOOT: moderately long, *stout*, heavily pubescent, *blackish brown*; *short internodes*; many spurs on heavy shoots.

LENTICELS: *numerous, conspicuous*, relatively large, gray, slightly raised.

BUDS: *large, heavily pubescent*, appressed to shoot.

ROOTS: initiated sparingly at each bud; scaffold roots few to medium, coarse, crooked; roots moderately fibrous, moderately brittle; bark medium thick, appears rough due to numerous, conspicuous, large, raised lenticels.

DIFFERS FROM:

Malling XVI by oval, heavier folded, more heavily pubescent leaves; duller leaf serrations; white and yellow color in growing tips; stout shoots with prominent lenticels and large, heavily pubescent buds.

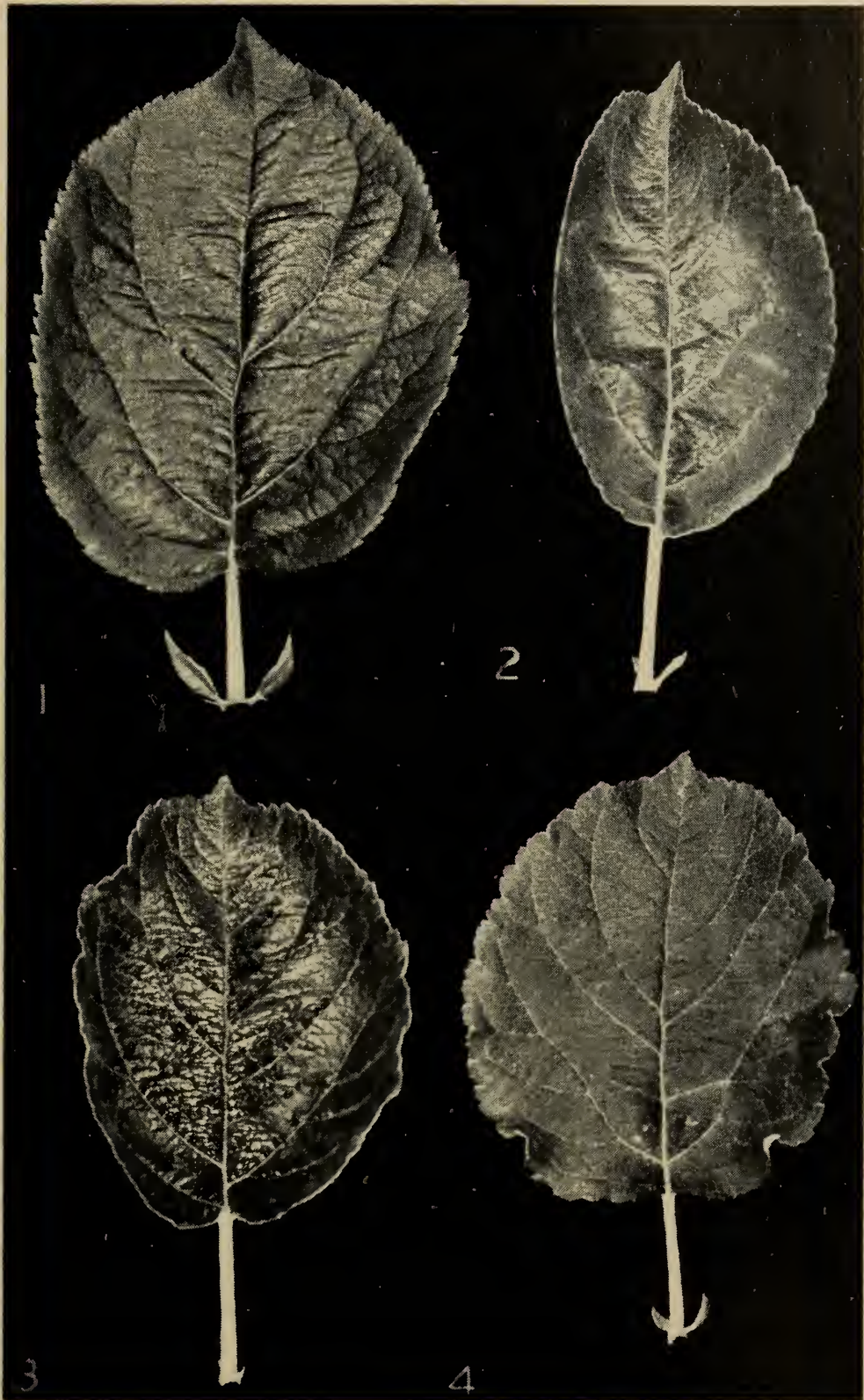


FIGURE 37. Typical leaves of four apple rootstocks.

1. MALLING I;
3. MALLING IV;

2. MALLING II;
4. MALLING VII.

MALLING IV

(Fig. 37-3)

LEAF BLADE: *small, roundish oval*, with relatively short, reflexed tip; slightly folded, *heavily waved, heavily wrinkled and pebbled*.

SERRATIONS: sharp, very deep, *coarse, irregular; some leaves lobed*.

PETIOLE: medium long, relatively narrow-angled; leaf pose upright-spreading.

GROWING TIP: *brownish*, heavily pubescent.

SHOOT: short, fairly *slender*, heavily pubescent at tip, *grayish brown, uniform* in color.

LENTICELS: inconspicuous, relatively small, flush.

BUDS: medium in size, acute, moderately pubescent, appressed to shoot.

ROOTS: initiated in moderate number at each bud; scaffold roots moderately numerous, uniformly distributed, medium and fine, fibrous, moderately brittle; bark thick, smooth; lenticels few, inconspicuous, relatively small.

MALLING VII

(Fig. 37-4)

LEAF BLADE: *roundish oval*, with short and reflexed tip, usually flat, *rigid, dark green, glossy*, wrinkled.

SERRATIONS: sharp, deep, *irregular; some leaves lobed*.

PETIOLE: long, slender, slightly red at base.

GROWING TIP: *yellowish brown*.

SHOOT: *long, slender*, vinaceous to grayish brown; spurs or side shoots absent or few.

BUDS: relatively *small, wide*, acute, moderately pubescent; *bud supports wide with prominent ridges*.

ROOTS: initiated in burr-knots; scaffold roots numerous, medium coarse, very fibrous, moderately tough; bark medium thick, dark brown, rough; lenticels few, inconspicuous.

MALLING IX

(Fig. 38-1)

LEAF BLADE: *medium large*, oval to ovate, slightly folded, moderately waved, *glossy, wrinkled*.

SERRATIONS: rather dull, coarse, single and double.

PETIOLE: relatively long and slender; shoot *defoliates very easily*.

GROWING TIP: heavily pubescent, *yellowish and brownish green*.

SHOOT: moderately long, *stout, straggling*, very *heavily pubescent*, vinaceous brown, greenish in patches; internodes relatively short; *wood very brittle*.

BUDS: *large, rather narrow, heavily pubescent*; bud supports prominent at lower buds.

ROOTS: initiated in moderate number at each bud; scaffold roots few to medium, some roots relatively coarse, many fine, fibrous roots; roots extremely brittle; bark very thick, smooth, pale in color; lenticels moderately conspicuous, raised.

MALLING XVI

(Fig. 38-2)

LEAF BLADE: *small*, ovate, slightly V-folded, *bluish green, very dull*.

SERRATIONS: sharp, medium coarse, irregular; *some leaves with entire margins*.

PETIOLE: moderately short, dark red at base; *leaf pose upright-spreading*.

GROWING TIP: *fresh green*, in striking contrast to dull green mature leaves.

SHOOT: long, moderately stout, straight, *dark livid brown to blackish brown; many spurs*.

LENTICELS: moderately conspicuous, gray, flush.

BUDS: large, acute, *moderately pubescent*; bud supports weak.

ROOTS: initiated in burr-knots; scaffold roots numerous, medium coarse, fibrous, tough; bark moderately thin, dark brown; lenticels inconspicuous.

DIFFERS FROM:

Malling II by smaller, ovate, duller, bluish green leaves; fresh green growing tips; sharper serrations, some leaves with entire margins; less prominent lenticels; thinner shoot tips.

Malling I by shorter internodes; darker bark color; prominent spurs; less prominent bud supports.



FIGURE 38. Typical leaves of three apple rootstocks.

1. MALLING IX;
2. MALLING XVI;
3. MALUS ROBUSTA No. 5.

MALUS ROBUSTA No. 5

(Fig. 38-3)

LEAF BLADE: large, ovate with somewhat *narrow base and long, sharp tip*; folding moderate, *margins frequently back-rolled*; leaf thick, semi-glossy, slightly pubescent.

SERRATIONS: sharp, fairly regular, mostly single.

PETIOLE: relatively long and slender, *almost glabrous*, deep red at base.

GROWING TIP: slightly pubescent, *yellowish and brownish green, dull*.

SHOOT: long, moderately stout, slightly zigzag, *slightly pubescent, grayish brown; scarf skin heavy; very many spurs and side shoots*.

LENTICELS: moderately numerous, medium large, *russet*, slightly raised.

BUDS: large, slightly pubescent; bud supports well developed and with all three ridges prominent.

ROOTS: scaffold roots many, coarse, crooked, branched, very fibrous, moderately brittle; bark moderately thin, reddish brown, appears rough; lenticels fairly prominent.

Apricot Rootstocks (Seedlings)

Apricot seedlings can be easily distinguished from other stone fruit rootstocks both by the aerial parts and by the roots. Identification of the seedlings of different apricot varieties was not attempted.

Apricot roots are medium coarse, fibrous, brittle; lenticels are numerous, conspicuous, large, raised; bark is thick, tough, with very characteristic beet-red color (1"i - 3"k) on surface; inner tissue of bark is white which turns to bright yellowish brown (15'i) after exposure to the air.

Descriptions of apricot roots are given by Heppner (19) and Day (8).

Cherry Rootstocks

MAZZARD F-12/1

(Fig. 39-1)

The clonal cherry rootstock MAZZARD F-12/1 can be distinguished from cherry seedlings and from cherry varieties.

LEAF BLADE: ovate, narrow, with relatively *narrow apex and long tip*, straight or slightly reflexed in midrib, *dark green, dull*, rather heavily pubescent.

PETIOLE: medium stout, pubescent, dark red; leaf pose spreading.

GLANDS: on petiole, 2 to 3, *dark red*.

GROWING TIP: *brownish red, dull*.

SHOOT: long, slender, straight, *glabrous*, smooth, *greenish brown*.

LENTICELS: *few*, fairly small, raised.

BUDS: medium small, narrow; somewhat narrow bud-shoot angle; prominent bud supports.

CHERRY SEEDLINGS

MAZZARD (*Prunus avium*) is practically the only rootstock used for cherries in the nurseries of British Columbia. Mazzard is the technical name for sweet cherry seedling. It may be raised from seed either of sweet cherry varieties or of "wild" sweet cherries. The seedlings from different cherry varieties are usually not distinguishable, and they can be certified only as seedlings grown from certified seed of a definite variety in cases where identification of variety by cherry stones is possible.

MAHALEB (*Prunus mahaleb*) cherry is now seldom used as a cherry rootstock in British Columbia. Mahaleb is very characteristic in many of its morphological characteristics (Fig. 39-2). A brief description is given below.

LEAF BLADE: *small, roundish with dull and reflexed tip, heavily U-folded, heavily waved, thick, semi-glossy, smooth, slightly pubescent.*

SERRATIONS: dull, shallow, coarse, irregular.

PETIOLE: short, glabrous; leaf pose drooping.

GLANDS: on petiole and blade, 1 to 2, globose, green.

GROWING TIP: green.

SHOOT: *slender, olive brown, heavily branched.*

LENTICELS: numerous, conspicuous, raised.

BUDS: relatively *small, glabrous, narrow-angled.*

Some experience is necessary in identification of mazzard and mahaleb cherries by their roots. Effective methods of distinguishing these two rootstocks by roots are given by several workers (8, 9, 19, 31, 44, 50). Characteristic differences as found in the present studies are given in the following comparison (Table 3).

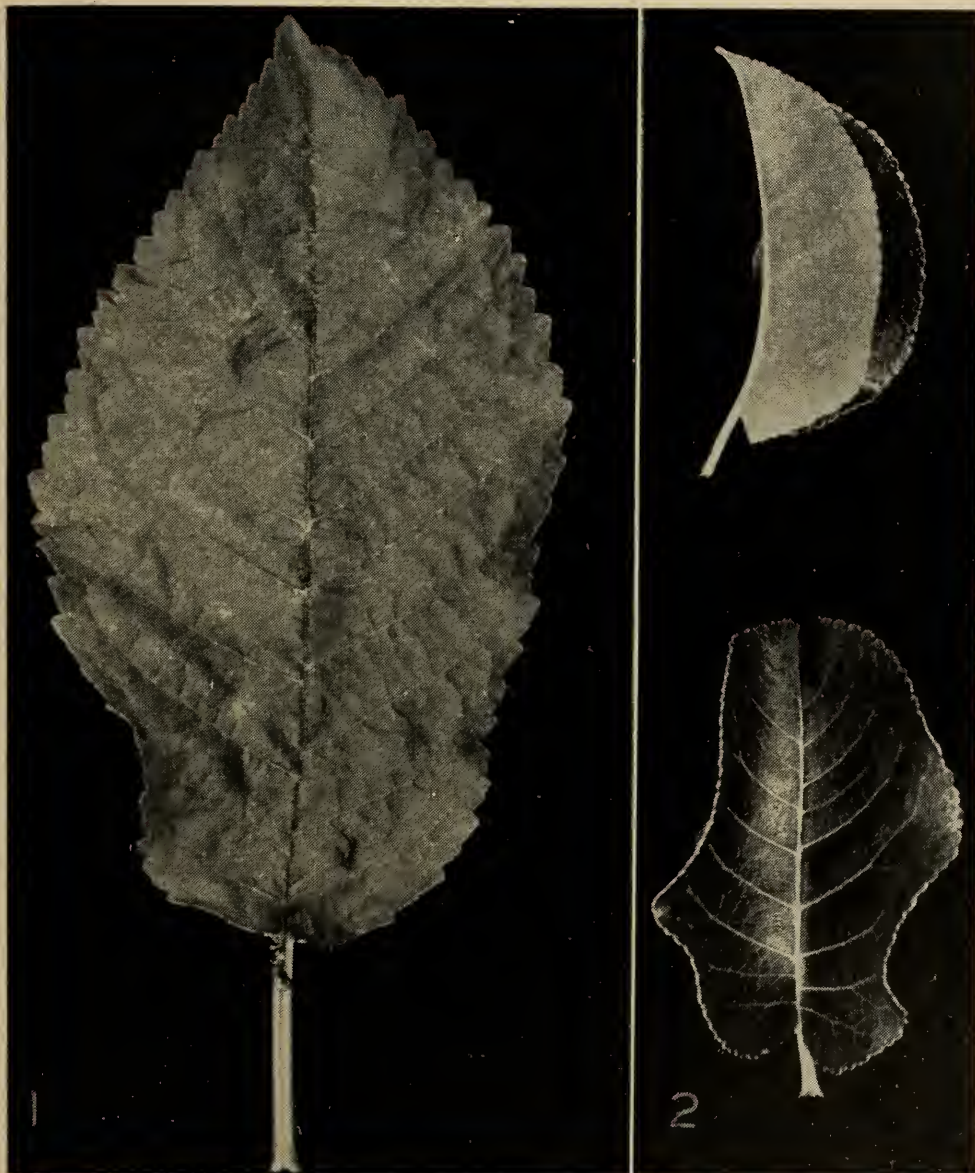


FIGURE 39. Typical leaves of cherry rootstocks.

1. MAZZARD F-12/1;

2. MAHALEB.

Table 3.—Comparison of Mazzard and Mahaleb Roots, 1 to 2 Years Old. 1952.

Characteristic	Mazzard	Mahaleb
Number of scaffold roots.....	medium to numerous	numerous
Quantity of fibrous roots.....	abundant	moderate
Bitterness of bark.....	very bitter	not bitter
Bark: surface.....	rough, with cork flakes	relatively smooth
color of surface.....	brown, dark (13"m-15"i)	grayish, dull (15"1-17"i)
color of inner tissue.....	greenish white (21"d-f)	white
discoloration in air.....	light orange (15')	cinnamon (15")
Color of wood tissue.....	white	yellowish
Coloration in 5n HCl, in 10-15 min:		
wood tissue.....	bright violet	yellowish to slightly violet
bark tissue.....	yellowish with violet streaks	pinkish with violet streaks
Coloration of extract from bark:		
in water, in 15 min.....	bright reddish yellow (17')	yellowish white (17' f)
in 10% FeCl ₃ , in 15 min.....	blackish brown	slightly colored
in 0.25n NaOH, in 1 hour.....	dark brick red	orange

Peach Rootstocks (Seedlings)

Most peach varieties are self-fertile and their seedlings are relatively uniform and closely resemble the mother variety. This factor may make the identification of peach seedlings possible, provided the mother variety possesses some distinguishable characteristics. However, identification and certification of seed material—peach stones—is more simple and reliable than that of the seedlings.

Peach seedlings differ in several of the characteristics mentioned under peach varieties, the number of leaf glands being the most convenient characteristic to observe.

Total number of glands per leaf (glands on petiole and blade) were counted in one planting in 1952. For comparison, total number of glands is given for the same varieties, except Muir.

Average of total number of glands per leaf:

Muir seedlings	15.4
Valiant seedlings	10.7 (Valiant variety 8.1)
Elberta seedlings	6.4 (Elberta variety 5.3)
Veteran seedlings	6.3 (Veteran variety 5.1)
Vedette seedlings	4.5 (Vedette variety 5.0)

It will be noted that the order for total glands is the same both in varieties and in seedlings of the same varieties. Differences between the various groups of seedlings in the number of total glands per leaf were significant in all cases except the difference between Elberta and Veteran seedlings.

Type of leaf glands makes possible distinguishing between the seedlings of Lovell and those of the other varieties listed above. The latter have reniform glands and their seedlings also normally have reniform glands. Gland conditions in Lovell seedlings are different, and these were examined in 5 plantings in 1952. One hundred leaves in each planting were collected and classified into 3 groups: eglandular, with globose glands, and with reniform glands. The results are presented in Table 4.

Table 4.—Grouping of Lowell Seedlings by their Leaf Glands in 5 Plantings, 1952.

Planting	Number of plants in each group		
	Eglandular	Globular	Reniform
1	22	50	28
2	29	46	25
3	30	39	31
4	26	45	29
5	25	49	26
Average (= in %)	26.4	45.8	27.8

The average figures for each group approached the expected ratio 1 : 2 : 1. Since Lovell has leaves with globose glands which represent the heterozygous condition (29), its seedlings segregate in respect to type of leaf glands. The ratio 1 : 2 : 1 indicates that seedlings have resulted from self-pollination. The great deviation from the expected ratio in planting 3 indicates the possibility of cross-pollination or a mixture in seed material.



FIGURE 40. Relationship of serrations and glands in peach leaves. Lovell seedlings.

1. Very deep, very sharp serrations, correlated to eglandular leaf.
2. Shallow, moderately sharp serrations, correlated to glandular leaf.

LOVELL SEEDLINGS will normally have about 25 per cent of the plants without glands. Leaves of the eglandular plants show sharp and deep serrations, compared with fairly shallow serrations on the leaves with glands. The type of serrations can be seen also in poorly developed seedlings which may not yet have developed glands (Fig. 40). Eglandular plants are characteristically susceptible to mildew.

Peach *roots* exhibit several prominent characteristics which make it possible to distinguish peach from other stone fruit rootstocks. Heppner (19) and Day (8) have given thorough descriptions of peach roots, especially in comparison with roots of David peach (*Prunus davidiana*) and almond (*Prunus amygdalus*).

Peach has numerous, medium coarse and fibrous scaffold roots; roots are moderately brittle; bark very thick, smooth, bark surface color yellowish, ranging from light (19''b) in one-year-old roots to clay color or cinnamon (17''-15'') in 2- and 3-year-old roots; inner tissue of bark is pinkish buff (17''d) which darkens to ochraceous buff (15'b) or cinnamon (15'') after exposure to the air; lenticels numerous, very conspicuous, very large and prominently raised above the bark surface.

Pear Seedlings and Quince Clonal Stocks

Pear seedlings are used almost exclusively as rootstocks for pear in British Columbia; a small percentage of trees is grown on quince.

BARTLETT AND OLD HOME SEEDLINGS are mostly used in British Columbia nurseries. It is difficult to separate these two groups of seedlings in the nursery row, although each of them exhibits some important characteristics, more or less reflecting the characters of the mother parent.

QUINCE MALLING A is vegetatively propagated and is generally used as a dwarfing stock. A very brief description is given.

LEAF BLADE: small, ovate, reflexed at base, slightly V-folded, thin, light green, dull, wrinkled, heavily pubescent; stipules large.

SERRATIONS: absent.

PETIOLE: short, stout, pubescent; leaf pose drooping.

GROWING TIP: heavily pubescent, brownish green.

ROOTS of pear seedlings and those of quince are fairly similar in young nursery trees but their identification does not present great difficulty. Heppner (19) has briefly reported on some anatomical differences of root tissue between pear and quince root, Randhava (30) has given brief morphological descriptions and notes on coloring of inner bark after treatment with different chemicals.

A summary of the most striking differences between these two roots, as found in the present studies, is given in the following table.

Table 5.—Comparison of Pear Seedling and Quince Roots, 1 to 2 Years Old. 1952.

Characteristic	Old Home seedling	Quince Malling A
Direction of lateral roots.....	moderately steep	relatively shallow
Scaffold roots.....	medium coarse, moderately fibrous	numerous, fine, very fibrous
Lenticels.....	moderately numerous	abundant
Bark color:		
surface.....	brown (13''k)	gray brown to black brown (15''k-5''m)
inner tissue.....	slightly yellowish (19''f)	slightly pinkish (17''f)
Discoloration of inner bark:		
in air.....	cinnamon (15'')	pinkish cinnamon (15''b)
in 1n NaOH, in 5-10 min.....	orange (13')	yellowish orange (15')
Coloration of extract from root pieces in 0.25n NaOH:		
in 10 min.....	orange red (9'i)	light orange red (11'i)
in ½ hour.....	intensive brownish red	slight brownish red

<i>Waving</i>	heavy and coarse—Brompton moderate to slight—Myrobalan 29C mostly slight—Marianna 2624
<i>Serrations</i>	dull, deep, coarse—St. Julien A sharp, relatively shallow, fine—Marianna 2624
<i>Glossiness</i>	glossy—Marianna 2624 semi-glossy—Myrobalan 29C somewhat dull—Yellow Kroosje
<i>Pubescence</i>	moderate—Brompton moderate to slight—Myrobalan 29C slight—Marianna 2624
<i>Smoothness of surface</i> ...	smooth—Yellow Kroosje moderately wrinkled—Marianna 2624 heavily wrinkled and veined—Myrobalan 29C

PETIOLE

<i>Length</i>	medium long—Marianna 2624 relatively short—St. Julien A
<i>Petiole shoot angle</i>	relatively narrow—Marianna 2624 medium wide—Myrobalan 29C wide—Yellow Kroosje

GLANDS

<i>Position</i>	mostly on petiole—Marianna 2624 on petiole and blade—Myrobalan 29C mostly on blade—Myrobalan B
<i>Size</i>	medium large—St. Julien A small—Brompton
<i>Number</i>	mostly 2—Marianna 2624 1 to 2—Myrobalan 29C less than 2 or absent—Myrobalan B

GROWING TIP

<i>Pubescence of tip leaves</i>	slight—Marianna 2624 moderate—Myrobalan 29C
<i>Color of tip leaves</i>	yellowish green—Myrobalan B yellowish brown—Myrobalan 29C dull brown—St. Julien A

DORMANT SHOOTS

<i>Length</i>	very long—Myrobalan 29C long—Marianna 2624 moderately long—St. Julien A
<i>Scarf skin</i>	light—Myrobalan B moderate—Brompton (Fig. 41) heavy—Marianna 2624 (Fig. 41)
<i>Color of bark</i> (middle portion of shoots)....	predominantly green—Myrobalan B bright brown—Yellow Kroosje dull dark brown—Myrobalan 29C violet brown—St. Julien A

BUDS

<i>Size</i>	large—Yellow Kroosje medium large—Marianna 2624 small—Myrobalan B
<i>Shape</i>	wide, blunt—Myrobalan B narrow, acute—Marianna 2624

Bud-shoot angle medium wide—St. Julien A
 narrow—Marianna 2624
 buds appressed to shoot—Myrobalan B
Bud support well developed—St. Julien A
 weak—Myrobalan B
 (Buds of Myrobalan B, Marianna 2624, Yellow Kroosje and St. Julien A shown in Fig. 42.)

ROOTS

Number of main roots . . . numerous—myrobalans
 moderately numerous—St. Julien A
 relatively few—Brompton
Size of main roots coarse—Brompton
 medium coarse—myrobalans
Amount of fibrous roots . very fibrous—St. Julien A
 moderately fibrous—Myrobalan B
Brittleness brittle—Yellow Kroosje
 moderately brittle—Myrobalan B (Fig. 43)
 tough—Marianna 2624 (Fig. 43), Myrobalan 29C
Thickness of bark thick—Brompton, St. Julien A
 thick to moderately thick—Marianna 2624
 moderately thick—Myrobalan B
Color of bark bright light brown—St. Julien A
 bright dark brown—Brompton
 dull dark brown—myrobalans
 (Variation in bark color due to growth rate is shown in Fig. 44.)
Lenticels numerous, conspicuous—St. Julien A
 moderate in number and
 prominence—Marianna 2624



FIGURE 43. (Left) Breaking surface of broken roots of two plum rootstocks.

1. MYROBALAN B—brittle root shows a few, rough splinters at the breaking surface;
2. MARIANNA 2624—tough root shows many, small splinters at the breaking surface.

FIGURE 44. (Right) Difference in bark color of roots due to difference in growth rate. Light streaks correspond to the fast growing sectors of roots, being in line with vigorously growing side roots.

BROMPTON

(Fig. 45-1)

LEAF BLADE: broadly oval to roundish with *broad, abrupt apex and short, wide tip; sharply reflexed and twisted*, very coarsely waved, slightly bluish green, dull, heavily wrinkled and pebbled.

SERRATIONS: dull, coarse, fairly regular, single and double.

GLANDS: *on blade, small, yellowish, 1 to 2, sometimes absent.*

GROWING TIP: yellowish brown.

SHOOT: long, fairly slender, *dark vinaceous brown, dull.*

BUDS: moderately *small, somewhat blunt*; bud-shoot angle variable—from narrow to medium and wide.

ROOTS: scaffold roots sparse, coarse, stout, fibrous, fairly brittle; bark thick, rough, bright dark brown; inner bark intensive brown after exposure to the air; lenticels numerous, conspicuous.



FIGURE 45. Typical leaves of six plum rootstocks.

1. BROMPTON;

2. YELLOW KROOSJE;

3. MARIANNA 2624;

4. MYROBALAN 29C;

5. MYROBALAN B;

6. ST. JULIEN A.

YELLOW KROOSJE

(Fig. 45-2)

LEAF BLADE: *broadly oval, slightly saucer-folded, light green, dull, rather heavily pubescent.*

PETIOLE: medium in size, pubescent, *bright red, definitely wide-angled*

GLANDS: on petiole, usually 2, *bright yellow.*

SHOOT: moderately long, slightly zigzag, *uniformly bright brown, heavily branched.*

BUDS: *large, relatively narrow and acute, many wide-angled;* bud supports fairly prominent.

ROOTS: scaffold roots moderately numerous to few, coarse, very fibrous, brittle; bark thick, smooth, light brown, bright; lenticels numerous, conspicuous, relatively large, raised.

MARIANNA 2624

(Fig. 45-3)

LEAF BLADE: oval with broadly *acute base, rather heavily U- to V-folded*, slightly waved, glossy, relatively smooth, slightly pubescent on lower surface.

SERRATIONS: medium sharp, fine, fairly regular.

PETIOLE: medium long, *roundish, pubescent on upper side*, usually narrow-angled.

GLANDS: *on petiole*, medium in size, *mostly 2*, globose to reniform.

GROWING TIP: yellowish brown; tip leaves *slightly pubescent.*

SHOOT: long, rather slender, slightly curved, *grayish* or dark vinaceous brown, *heavy scarf skin;* side shoots medium to many.

BUDS: *medium large, narrow, acute*, frequently in compact groups of 3, bud-shoot angle narrow.

ROOTS: scaffold roots well developed, moderately numerous, medium coarse, long, slender, fibrous, tough; bark medium thick, not very rough; lenticels moderately numerous.

DIFFERS FROM:

Myrobalan 29C by glossy, more folded, less wrinkled, less veiny, darker colored, thicker leaves; longer, thicker, roundish petiole; larger, well-retained glands; less vigorous growth; less branching; better maturity of shoots; more gray, less green color in bark; heavier scarf skin; larger, longer buds.

MYROBALAN 29C

(Fig. 45-4)

LEAF BLADE: obovate to oval, moderately V-folded, medium to light green, semi-glossy, moderately pubescent, *heavily veined and wrinkled.*

PETIOLE: *small, oval in cross-section, pubescent*, wide-angled.

GLANDS: *on petiole and blade, fairly small*, globose, 1 to 2.

GROWING TIP: yellowish brown; tip leaves *moderately pubescent.*

SHOOT: very long, slightly straggling, dark brown with *slight green on shaded side;* many side shoots from current year's growth.

BUDS: relatively *small*, medium narrow, mostly *appressed* to shoot.

ROOTS: scaffold roots numerous, medium coarse, long, moderately fibrous, moderately tough; bark medium thick, fairly smooth, dark brown, dull; lenticels numerous, fairly conspicuous.

DIFFERS FROM:

Marianna 2624 by more heavily wrinkled and veined, heavier pubescent, less folded, less shiny leaves; more heavily pubescent, smaller petiole; smaller glands; more vigorous growth; heavier branching; more green color on shaded side of shoots; shorter buds.

MYROBALAN B

(Fig. 45-5)

LEAF BLADE: *small, oval with long, reflexed tip*; mostly flat, heavily veined and wrinkled, semi-glossy.

SERRATIONS: *deep, coarse*, irregular.

PETIOLE: *relatively long, wide*, pubescent on upper surface, yellowish.

GLANDS: *on blade*, mostly globose, yellowish, *1 to 2, frequently absent*.

GROWING TIP: *yellowish green*.

SHOOT: very long, slender, light brownish olive on sunny side and *yellowish olive on the shaded side*; scarf skin light; internodes short; spurs and side shoots many.

BUDS: *small, broad, appressed* to shoot; bud supports weak.

ROOTS: scaffold roots numerous, medium coarse, long, straight, fibrous, brittle; bark medium thick, dark brown, dull, lenticels numerous, conspicuous, raised, relatively small.

ST. JULIEN A

(Fig. 45-6)

LEAF BLADE: *small, broadly oval, heavily reflexed* in midrib, slightly V-folded, coarsely waved, *thick, dark green, dull*, wrinkled.

SERRATIONS: *dull, very coarse*, somewhat irregular.

PETIOLE: stout, short, dark red, wide-angled.

GLANDS: *on petiole, mostly 2, large*, yellowish.

GROWING TIP: *dull, brownish*.

SHOOT: moderately long, rather slender, *dark vinaceous brown*, uniform in color.

LENTICELS: *numerous, conspicuous*, slightly raised.

BUDS: moderately large, blunt, *many wide-angled*; bud supports prominent.

ROOTS: scaffold roots fairly shallow, moderately numerous, relatively weak, crooked, medium to fine, very fibrous, moderately tough; bark thick, rough, relatively light and bright in color; lenticels numerous, conspicuous, raised.

PERSHORE

See under Yellow Egg in Plum varieties.

STONE CHARACTERISTICS OF SOME PEACH, APRICOT AND CHERRY VARIETIES

Blake and Edgerton (2, 3) have studied the peach stones as a means of variety identification and given descriptions of the stones of the New Jersey peach introductions. Sidwell and Freeman (40) have given valuable suggestions regarding the terminology of plum stone characteristics.

A brief survey is given of some stone characteristics valuable in identification of some stone fruit varieties. Variety descriptions are presented only of those varieties which might have a value as a source of seed for raising seedling rootstocks in the nurseries of British Columbia.



FIGURE 46.

Left: Peach stones in three different views.

1. Face view; 2. Ventral suture facing up; 3. Dorsal suture facing up.

Right: Dorsal suture and surface markings in peach stones.

Upper row, *dorsal suture*: 1. LOVELL—cleft; 2. VETERAN—entire and sinuate.

Lower row, *surface*: 1. LOVELL—deeply grooved, apex honeycombed; 2. VALIANT—pitted, no honeycombs.

Peach Varieties

The main parts of the peach stones are shown in Fig. 46.

Varieties differ considerably in the *size* of the stones, varying from large as in Elberta to small as in Lovell and Veteran.

The *shape* or outline of the face-view of the stone is a valuable varietal characteristic. The outline may be definitely obovate with a broad apex and narrow base as in Lovell or it may be nearly pentagonal with a rather wide base as in Vedette; if the base is still wider and the shape more rounded it appears nearly oval as in Muir, or tends to approach ovate outline as in Elberta.

The face-view outline of peach stones is asymmetrical in most varieties as in Veteran or Vedette; in some varieties, however, the outline may be symmetrical or nearly so, as in Lovell and Muir.

Thickness or plumpness characterizes some varieties. Stones may be plump as in Lovell, moderately thick as in Veteran, or somewhat flat as in Elberta and Vedette.

The *base* of the stone may vary from narrow as in Lovell to relatively wide as in Vedette, most other varieties having medium wide bases.

Varieties may differ in configuration of the *basal line* of the stone. A straight basal line is usually associated with a wide base as in Vedette and Elberta, while a rounded basal line is usually found in varieties with a narrow base, as in Lovell or Veteran.

The *apex* is broad and abrupt in most peach stones as in Lovell; it occasionally may be broadly acute and only slightly abrupt, as in Elberta.

The *tip* of the stone shows slight variation between varieties. It may be long as in Elberta, moderately long as in Valiant, or moderately short as in Veteran.

The *ventral suture* may be valuable in peach variety identification. It is the edge of the stone adjoining the fruit suture. The ventral suture is wide and marked with several grooves. As the formation of the suture varies considerably from stone to stone, varietal differences can be detected only in large samples. The ventral suture may vary in width from wide as in Lovell, through moderately wide as in Valiant, to relatively narrow as in Elberta. In cross section it may be nearly flat as in Lovell, slightly sloping or rounded as in Valiant, or keeled and sloping as in Elberta. In all varieties the suture is grooved, forming narrower or wider ridges, some of which may be slightly pitted as in Lovell.

The *dorsal suture* in peach stones is characterized by a rather deep central groove, which is formed by the margins of the stone halves extending beyond the joint or seam-line. The edges may be far extended as in Elberta to moderately extended as in Muir. The edges of the margins are obliquely cleft in most varieties, as Lovell; in some varieties they may be sinuate or nearly entire as in Veteran (Fig. 46).

Surface markings of peach stones may be characteristic of varieties, although the varieties in the present investigation did not exhibit as great variation in their surface formations as found in varieties studied by Blake and Edgerton (3). Most of the varieties in this test had both long grooves and roundish pits on their surface; the exception was Lovell which showed deep grooves almost entirely. In addition to these deep depressions in the stone, fine, round, and regular depressions were observed in some varieties; in these cases the surface is said to be honeycombed. While Vedette and Lovell pits are more or less honeycombed all over, and Elberta shows this condition mostly at the apex end, Valiant and Veteran pits are seldom honeycombed (Fig. 46).

ELBERTA

(Fig. 47-1)

Stone, large, long, ovate, somewhat flat with maximum thickness near the apex; base medium wide, obtuse, slightly one-sided; apex broadly acute, slightly asymmetrical; tip long, acute; ventral suture prominent, rather narrow with several grooves; dorsal suture medium wide with far extended and obliquely cleft margin; surface marked with grooves and pits, the apex end slightly honeycombed.

Prominent characteristics. Stone large, long, flat with long, sharp tip; surface grooved and partly honeycombed.

LOVELL

(Fig. 47-2)

Stone medium to small, obovate, symmetrical, plump, with the maximum thickness definitely at the apex end; base narrow, rounded; apex broad, definitely symmetrical; tip long, acute; ventral suture wide, flat with at least two prominent,

honeycombed ridges; dorsal suture medium broad with extended and obliquely cleft margin; surface typically grooved with very deep line grooves, partially honeycombed.

Prominent characteristics. Stone symmetrical, thick, obovate; apex abrupt, tip long; surface very deeply grooved, slightly honeycombed at apex; ventral suture flat, wide; dorsal suture obliquely cleft.



FIGURE 47. Typical stones of three peach varieties.

1. ELBERTA; 2. LOVELL; 3. MUIR.



FIGURE 48. Typical stones of three peach varieties.

1. VALIANT; 2. VEDETTE; 3. VETERAN.

MUIR

(Fig. 47-3)

Stone medium to small, oval, symmetrical, moderately thick; base medium wide, rounded to obtuse; apex broad, symmetrical; tip long, acute; ventral suture sloping to rounded; dorsal suture with slightly extended and obliquely cleft margin; surface grooved and pitted, some grooves branched.

Prominent characteristics. Oval, symmetrical stones; narrow dorsal lobes; surface mostly grooved; some grooves branched.

VALIANT

(Fig. 48-1)

Stone medium large, obovate, asymmetrical in face view, plump, with maximum thickness near the apex; base medium wide, rounded to obtuse; tip medium long, acute; ventral suture usually wide with some wide ridges; dorsal suture deep, medium wide with entire or obliquely cleft, extended margin; surface pitted and grooved, markings large and deep.

Prominent characteristics. Large, plump, obovate stone with deep pits and grooves; dorsal suture with a rather far extended margin.

VEDETTE
(Fig. 48-2)

Stone fairly long, pentagonal to obovate and asymmetrical in face view, fairly flat; base wide, obtuse, regular; apex broad to broadly acute, asymmetrical; tip medium long, acute; ventral suture wide with honeycombed, wide ridges; dorsal suture deep with widely extended, obliquely cleft or sinuate margin; surface pitted, grooved, and prominently honeycombed.

Prominent characteristics. Asymmetrical, relatively flat stone with acute tip; wide base; extended, sinuate margin on dorsal suture; surface definitely honeycombed.

VETERAN
(Fig. 48-3)

Stone medium and small, variable, pentagonal and obovate, asymmetrical in face view, plump; base medium wide, rounded, regular; apex broad, asymmetrical; tip short, fairly acute; ventral suture medium wide to narrow with relatively narrow ridges; dorsal suture deep with entire or sinuate and extended margin; surface pitted and grooved, some spots honeycombed; pits and grooves only moderately deep.

Prominent characteristics. Relatively small, plump, asymmetrical pits with short tip; dorsal suture with extended, sinuate margin; ventral suture relatively narrow.

Apricot Varieties

The principal parts of the apricot stones are shown in Fig. 49.

Size of stones may vary considerably in apricot varieties—from large as in Perfection to small as in Blenheim.

Shape of stones in the face-view is a valuable character of identification. Stones may be oval as in Reliable or Tilton, oval to obovate as in Wenatchee, or broadly obovate to roundish as in Blenheim.



FIGURE 49.

Left: Apricot stones in three different views.

1. Face view; 2. Ventral suture facing up; 3. Dorsal suture facing up.

Right: Dorsal grooves and shoulder grooves in apricot stones.

Upper row, *dorsal grooves*: 1. WENATCHEE—grooves at both ends, prominent pits in dorsal suture; 2. PERFECTION—short groove at basal portion; 3. BLENHEIM—prominent groove in apical region.

Lower row, *shoulder groove*: 2. PERFECTION—sunken in stone; 3. BLENHEIM—on a ridge.

Stones of most apricot varieties are slightly asymmetrical; some varieties, however, may have nearly symmetrical stones; as Perfection.

Apricot varieties differ greatly in *thickness* or plumpness of the stones. Stones may be plump as in Tilton, moderately thick as in Perfection, or moderately flat as in Wenatchee.

The *base* of the stone may be wide as in Blenheim and Perfection, medium wide as in Tilton, or medium narrow as in Wenatchee; the basal portion of the stone may be slightly drawn out as in Wenatchee.

The *socket*. The part of the base in which the fruit stem is anchored is called the socket. It may be regular as in Perfection or irregular (one-sided) as in Reliable. Further, the socket may be obtuse as in Wenatchee or concave as in Perfection.

The *apex* is a valuable varietal characteristic. It may be very broad and rounded as in Blenheim and Perfection, broad as in Tilton, or broadly acute as in Reliable.

The *tip* of the stone may vary from extremely short as in Blenheim, to moderately short as in Reliable.

Ventral suture in apricot stones is in the form of a wide keel, separated from the face of the stone by the shoulder groove. The ventral suture may be sloping and slightly extended as in Tilton, or it may be keeled or keel-formed and widely extended as in Blenheim and Perfection. A widely extended ventral suture may occupy over 25 per cent of the width of a stone. If the margin of the ventral suture is thin and extended, the suture is said to be winged.

Shoulder groove separates ventral suture from face. It may be sunken in the stone as in Perfection or it may lie on a ridge as in Blenheim (Fig. 49). Many apricot varieties belong to the latter group.

Usually there are pits and grooves on the *surface of the ventral suture*. Tilton has mostly pits on the ventral suture, Reliable and Wenatchee have mostly shallow grooves, while Blenheim and Perfection have both pits and grooves.

The *dorsal suture* in apricot stones is a rounded seam. It may be closed for its whole length or it may have longer or shorter grooves at one or both ends. This condition appears to be a valuable varietal characteristic. Wenatchee has well-developed dorsal grooves at both ends, extending for about one-third to one-half of the length at each end, while Perfection has no groove at the apex end and only a short or no groove at the basal end; other varieties take an intermediate place in this respect (Fig. 49).

More or less prominent *pits* are scattered along the dorsal suture, especially along its entire, non-grooved portion. Pits may be conspicuous and numerous as in Perfection and Wenatchee, or inconspicuous and few or absent as in Tilton and Blenheim.

Surface of the stone may be almost smooth as in Tilton, slightly etched as in Reliable, or deeply etched and with ridges at the base as in Perfection.

BLENHEIM

(Fig. 50-1)

Stone fairly small, roundish to broadly obovate, plump; base medium wide, obtuse, nearly regular; apex very broad, tip very short; ventral suture keeled and winged, some pits and grooves on suture; shoulder groove on a ridge; dorsal suture grooved at apex in about one-third of the whole length; frequently a short groove also at base; a few pits along dorsal suture; surface etched, fairly rough.

Prominent characteristics. Small, roundish, plump stone with very broad apex and very short tip; extended ventral suture.

TILTON
(Fig. 50-2)

Stone medium and small, oval, plump; base medium to narrow; socket obtusely pointed; apex broadly acute, slightly asymmetrical; tip medium short, acute; ventral suture sloping to keeled, with pits on both sides of the suture; shoulder groove on a ridge; dorsal suture medium broad, grooved at apex in one-third to one-half of the length of suture, sometimes slightly grooved at base; a few pits along the dorsal suture; surface almost smooth.

Prominent characteristics. Medium to small, plump stone with a narrow, slightly drawn-out base; dorsal suture with a relatively long groove at apex; pits few or absent on dorsal suture; smooth surface.



FIGURE 50. Typical stones of five apricot varieties.

1. BLenheim; 2. TILTON; 3. RELIABLE; 4. WENATCHEE; 5. PERFECTION.

RELIABLE
(Fig. 50-3)

Stone medium large, oval, plump; base medium wide, obtuse to rounded, slightly one-sided; apex broadly acute, nearly symmetrical; tip medium long, acute; ventral suture keeled, with shallow grooves; shoulder groove on a ridge; dorsal suture broad, with a short groove at apex; groove at the basal end is short or absent; many (approx. 10) small pits along the dorsal suture; surface finely etched, appears relatively smooth, but deeply etched at apex and with ridges at base.

Prominent characteristics. Oval, plump stone; very short grooves and many pits at dorsal suture; surface deeply etched at the apex, ridged at the base.

WENATCHEE

(Fig. 50-4)

Stone medium large, broadly oval to obovate, slightly asymmetrical, rather flat; base fairly narrow, drawn out; socket obtuse, regular; apex broad to broadly acute; tip medium short, acute; ventral suture keeled, with shallow grooves; shoulder groove on a ridge; dorsal suture rounded, grooved at both ends, grooves occupy one-third to one-half of the whole length; many conspicuous pits along the dorsal suture; surface etched, some ridges extend from base and ventral suture onto the face of stone.

Prominent characteristics. Relatively large, flat stone; dorsal suture prominently grooved and with conspicuous pits; base slightly drawn out; surface relatively rough.

PERFECTION

(Fig. 50-5)

Stone large to medium, broadly oval, symmetrical, moderately thick; base medium wide, rounded, sometimes with a concave socket, regular; apex broad, symmetrical; tip short to very short; ventral suture keeled and winged, with pits and some grooves on both sides of the suture; shoulder groove slightly sunken in stone; dorsal suture medium narrow; groove short at base or absent; prominent pits, 6 to 10, along the dorsal suture; surface deeply etched; some prominent ridges extend from base and ventral suture onto the face of stone.

Prominent characteristics. Broadly oval, nearly symmetrical stone; keeled ventral suture; dorsal suture entire or with a short groove at the basal end, prominently pitted; shoulder groove mostly sunken in stone; rough surface.

Cherry Varieties

Some details of cherry stones are shown in Figure 51.

Cherry stones vary in size—from large as in Bing to small as in Van.

Shape of the stones in the face-view may be ovate as in Gold, oval to ovate as in Bing, or roundish as in Van. In the face view stones may be relatively symmetrical as in Lambert or asymmetrical as in Van. The *base* of the stone may be regular as in Gold and Lambert or irregular as in Van and Bing. Irregularity of the base is mostly caused by the protruding tissues of the ventral suture. At the base of the stone, under the tissues of ventral suture there is a larger or smaller opening—called micropyle. *Micropyle* is relatively large in Bing and Van but fairly small in Gold. The *apex* may vary from broad in Van to broadly acute in Lambert. The *tip* varies from acute as in Gold to rounded as in Van.

Ventral suture in cherry is wide and marked with grooves. It may differ in length and width by variety. The suture may be nearly parallel-sided for almost its whole length as in Van, the maximum width may be in the middle as in Gold, or near the apex as in Bing. In length, the ventral suture may sometimes extend slightly beyond the base of the stone, thus making the base irregular, as in Bing and Van.

Dorsal suture of the cherry stones is in the form of a sharp line. From it small veins extend onto the face of the stone. The veins may be slightly developed as in Bing and Lambert or rather prominent as in Gold and Van.

The *surface* of cherry stones is relatively smooth. There are, however, a few ridges extending from the base of the stone or from the ventral suture onto the face of the stone. The ridges may be slightly raised and short as in Lambert or relatively prominent as in Bing.

Color of the stones is light gray in the red-fruited varieties. The stones of Gold are nearly white.

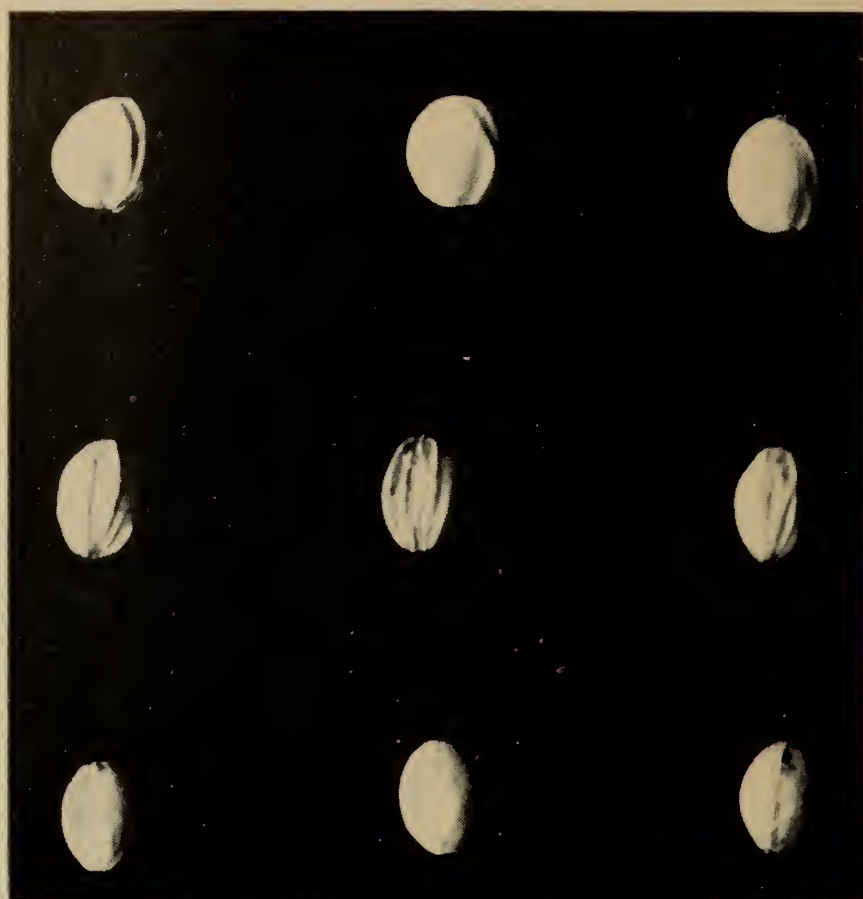


FIGURE 51. Cherry stones in three different views.

Upper row—face view, middle row—ventral suture facing up,
lower row—dorsal suture facing up.

BING

(Fig. 52-1)

Stone oval to ovate and asymmetrical in face-view; base one-sided with a large micropyle; apex very broad, asymmetrical; tip dull, frequently not protruded, as the ventral suture extends to the very tip; ventral suture rounded to sloping, wide and long with prominent ridges, sometimes extending in length beyond the base of stone, maximum width near the apex; dorsal suture sharp with slight veins extending onto the face of the stone; surface smooth, with some ridges extending from base or ventral suture.

Prominent characteristics. Stone oval to ovate, asymmetrical; wide and long ventral suture; dull, rounded tip; prominent ridges at the base and ventral suture; large micropyle.

GOLD

(Fig. 52-2)

Stone medium in size, ovate, slightly asymmetric; maximum thickness near the base; base rounded, smooth, fairly regular; micropyle fairly small; tip acute; ventral suture rounded at base, sloping at apex, medium wide; dorsal suture sharp, with some veins extending onto the face; surface smooth, with a few short ridges at base; color yellowish white.

Prominent characteristics. Ovate, almost symmetrical stone, fairly uniform in shape; base smooth, tip sharp; surface smooth, white.

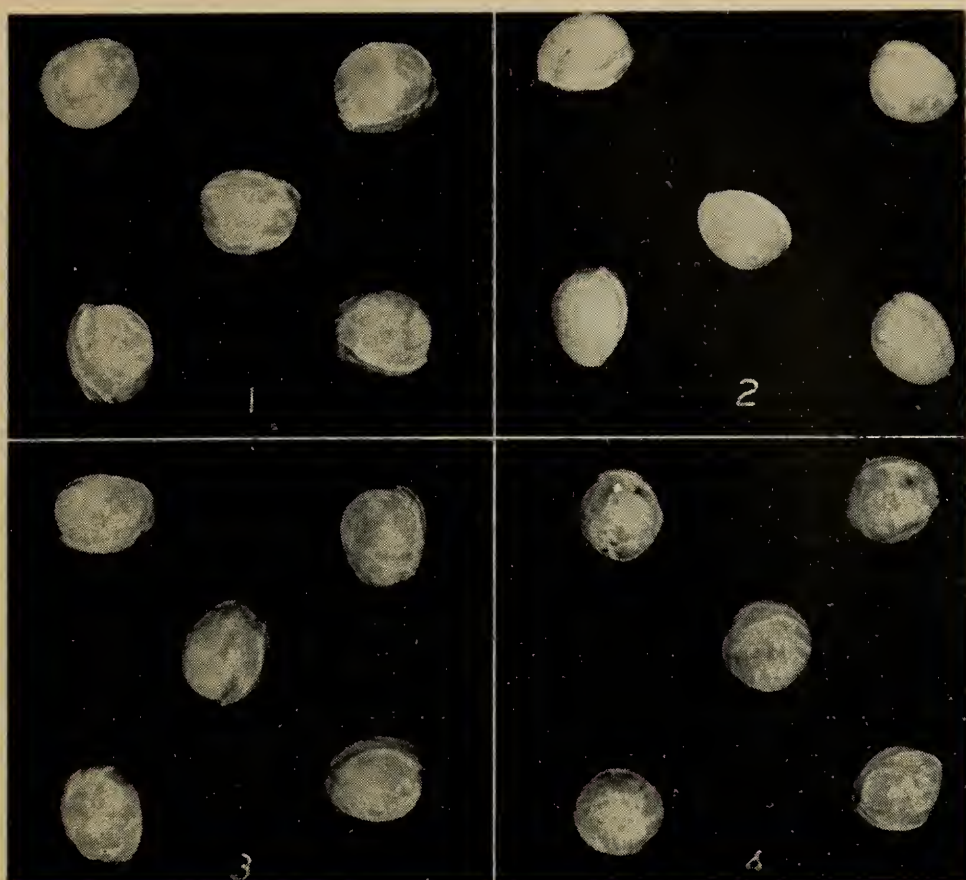


FIGURE 52. Typical stones of four cherry varieties.

1. BING; 2. GOLD; 3. LAMBERT; 4. VAN.

LAMBERT
(Fig. 52-3)

Stone medium in size, ovate, fairly symmetrical; base wide, regular, rounded; micropyle medium in size; apex broadly acute; tip rather acute; ventral suture rounded and sloping, medium wide, with well-developed side ridges; dorsal suture sharp and straight; surface smooth, with a few slight ridges at base.

Prominent characteristics. Ovate, symmetrical stone; smooth surface; well-developed, sharp dorsal suture.

VAN
(Fig. 52-4)

Stone small, roundish, prominently asymmetrical, plump; base one-sided; micropyle large; apex very broad, asymmetrical; tip rounded; ventral suture rounded and sloping, relatively wide, very prominent at base, with prominent side ridges; dorsal suture sharp and extended, with side veins; surface slightly netted, appears rough; some ridges extend from base.

Prominent characteristics. Small, roundish, asymmetrical stone; very broad apex; ventral suture prominent at base; sharp dorsal suture.

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